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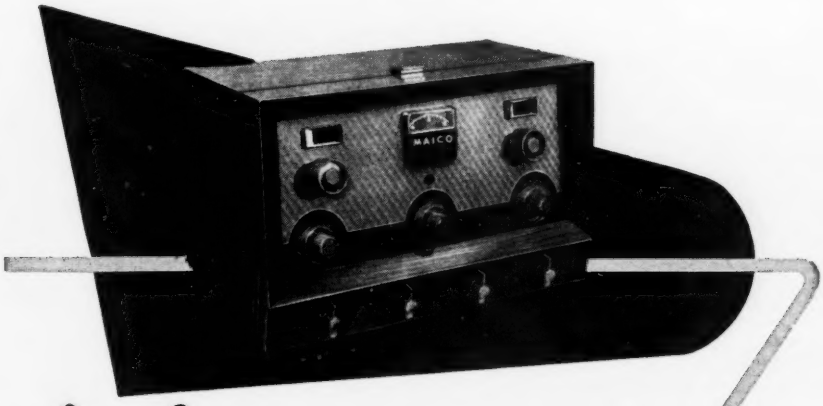

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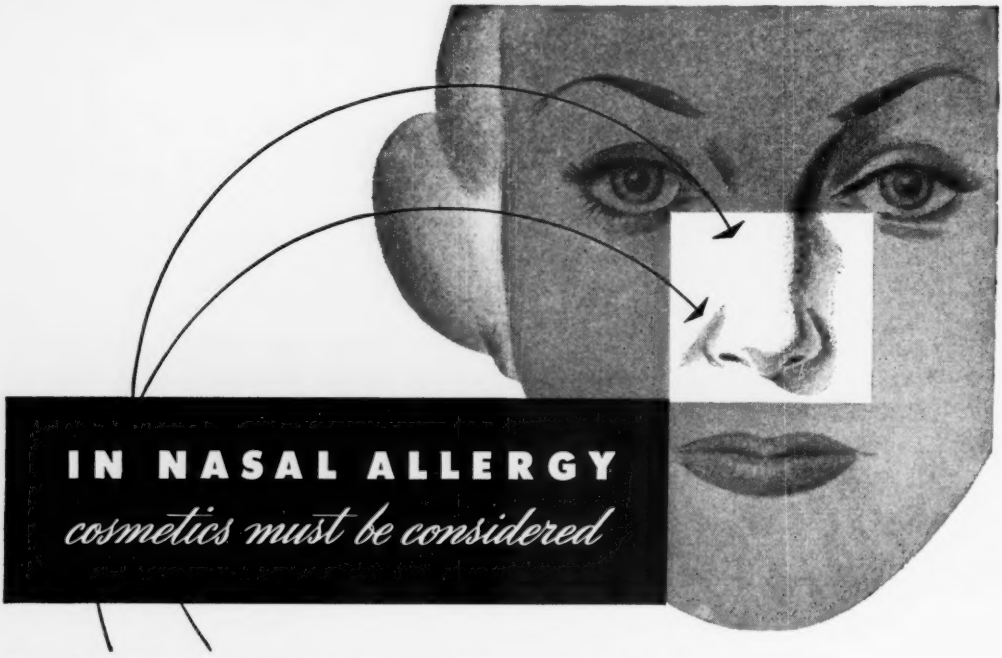

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ONE-STAGE RADICAL RESECTION OF CERVICAL ESOPHAGUS, LARYNX, PHARYNX, AND LATERAL NECK

With Immediate Reconstruction

JOHN J. CONLEY, M.D.
NEW YORK

A ONE-STAGE operation for the treatment of patients with extensive cancer of the pharynx, hypopharynx, postcricoid areas, and cervical esophagus has been developed in the hope of mitigating the morbidity encountered in the treatment of these patients by the multiple-stage method of excision and delayed reconstruction of the pharynx and esophagus. This one-stage operation consists of radical resection of the cancerous growth in the pharynx, esophagus, and neck and immediate reestablishment of continuity between the fenestrae in the oral pharynx and cervical esophagus by the careful anastomosis of a free thick-split skin graft to these structures. The free tubed graft is covered inferiorly with the lobes of the thyroid and superiorly by the associated prevertebral fascia and the skin flaps of the neck. Postoperative contracture is mitigated by the implantation of an inert stent and bouginage.

INDICATIONS

Patients for whom this type of operation is indicated are divided into those requiring the excisional phase and those requiring the reconstructive phase.

Indications for the excisional phase are (1) extensive cancer of the cervical esophagus; (2) extensive cancer of the pharynx and hypopharynx, and (3) extensive cancer of the extrinsic larynx and pharynx.

If the cancerous process occupies more than 70% of the circumference of the pharyngeal food passage, a total circumferential excision should be performed. It is rarely possible to perform less than a total circumferential excision in cancer of the cervical esophagus due to submucosal extension and "skip areas." The amount of mucosa that can be saved for the repair is, of course, in inverse proportion to the size of the cancer. If there is encroachment upon the larynx, that organ should be sacrificed in continuity with the structures named. If there is evidence of metastasis to one or both sides of the neck, a radical block dissection of the involved side of the neck should be carried out in continuity with the primary cancer.

Indications for the reconstructive phase are (1) resections that have included the entire circumference of the pharyngeal or esophageal apparatus; (2) resections that have included more than 70% of the circumference, thus precluding the immediate formation of a tubed passage with the remaining mucosa, and (3) pharyngeal and esophageal defects which have been unsuccessfully handled with other reconstructive techniques.

From the Head and Neck Service, Pack Medical Group, and the Surgical Service, St. Vincent's Hospital.

This operation is not warranted in areas that have been heavily irradiated or are grossly secondarily infected, as these factors would seriously decrease the chances of a successful "take" of the free graft.

RATIONALE

The incidence of infection of a free skin graft prior to advent of biotherapy would have been so high under the circumstances ordinarily encountered as to make use of such a graft in the esophagus and pharynx unwarranted. With the availability of numerous biotherapeutic agents today, the fear of loss of the graft by infection is greatly lessened.

Skin grafting into the oral cavity in the form of an inlay or onlay graft has proved successful in repairing large wounds in areas where a considerable amount of

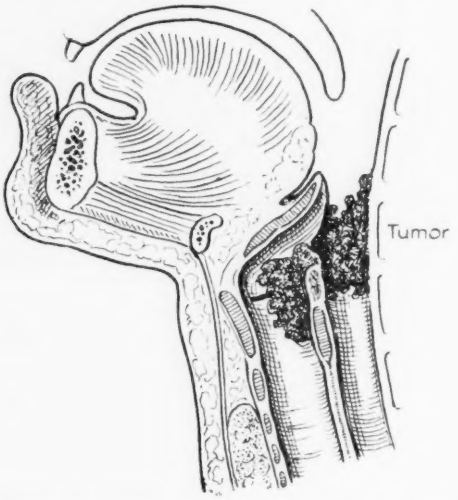

Fig. 1.—Extensive cancer of pharynx, larynx, and postcricoid region requiring total excision of all these areas.

mucosal surface has been sacrificed. Free skin grafts have been used to advantage in the oral cavity in the repair of the buccal areas, re-creation of a glossoalveolar sulcus, liberation of the lips, covering of the tongue, release of the tongue from the palate and pharynx, and reconstruction of pharyngeal defects. The use of the free, thick-split, tubed graft in the pharyngeal and esophageal areas is merely an extension of the established principle of intraoral grafting. The aim of the technique is to cause an abridgement of the surgical defect between the oral cavity and the esophagus and immediately establish the continuity of the food passage.

TECHNIQUE

The technique of excision of the cancer and its associated areas is unaltered from the techniques in common use. If the primary cancer involves the major part of the pharynx and has extended into the larynx (Fig. 1), a radical pharyngectomy and

laryngectomy are carried out in continuity. If there is evidence of metastasis to one or both lateral areas of the neck, a block dissection of these areas is carried out in continuity with the primary specimen. If the primary cancer is an extensive one involving the postcricoid area (Fig. 2), this postcricoid area is radically excised

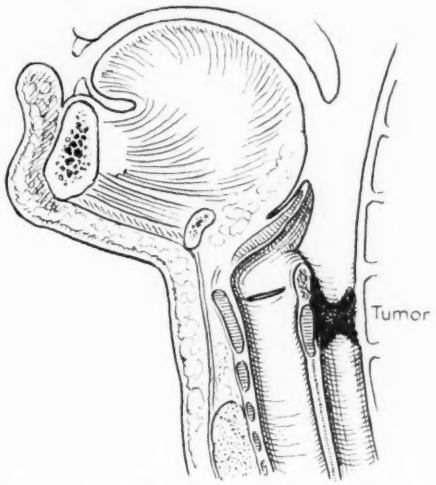

Fig. 2.—Obstructive cancer of cervical esophagus.

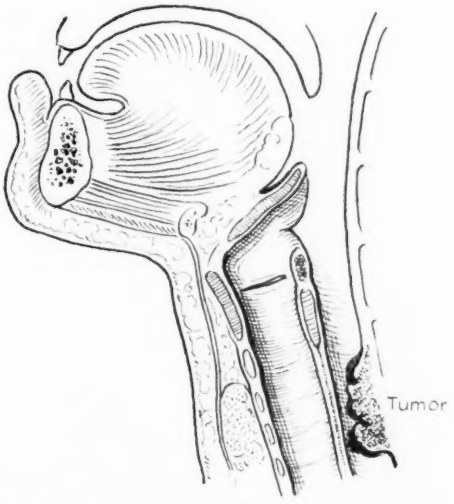

Fig. 3.—Localized posterior infracervical esophageal cancer.

along with performance of a laryngectomy and resection of the cervical esophagus and hypopharynx. If there is evidence of metastasis to the lateral part of the neck, a block dissection of the neck is carried out in continuity with the primary specimen. If the primary cancer is an extensive one involving the superior portion of the

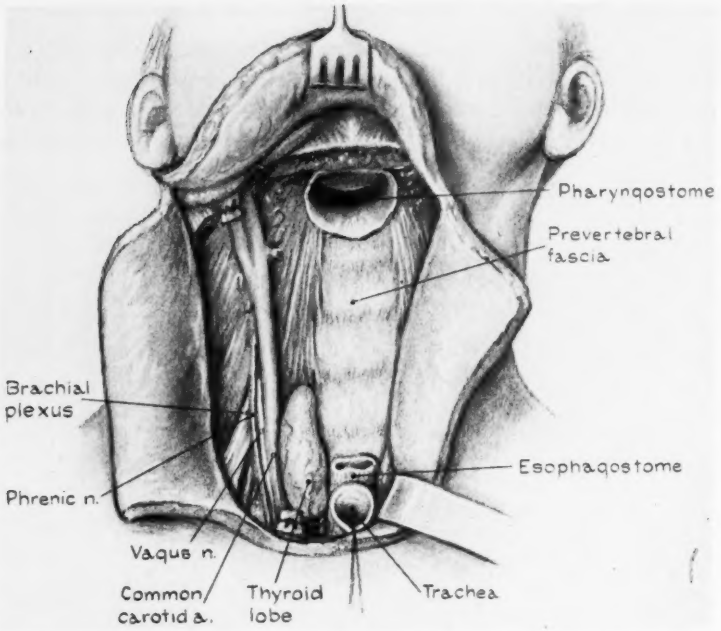

Fig. 4.—Radical resection of pharynx, larynx, cervical esophagus, and right lateral part of neck.

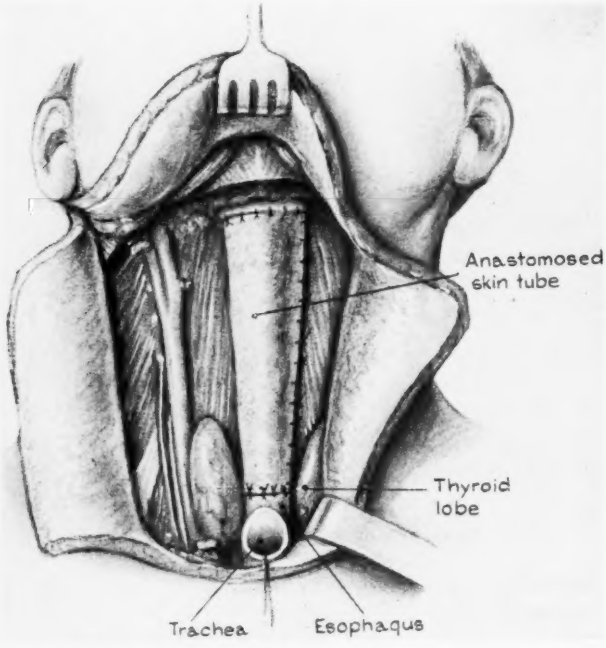

Fig. 5.—Tubed, thick-split, free skin graft anastomosed to pharyngostoma and esophagostoma.

cervical esophagus, a cervical esophagectomy and laryngectomy are performed in continuity. If there is evidence of metastasis to the lateral part of the neck, a block dissection of the neck is added in continuity with the primary specimen. The larynx is not sacrificed for small, limited carcinomas of the inferior portion of the posterior

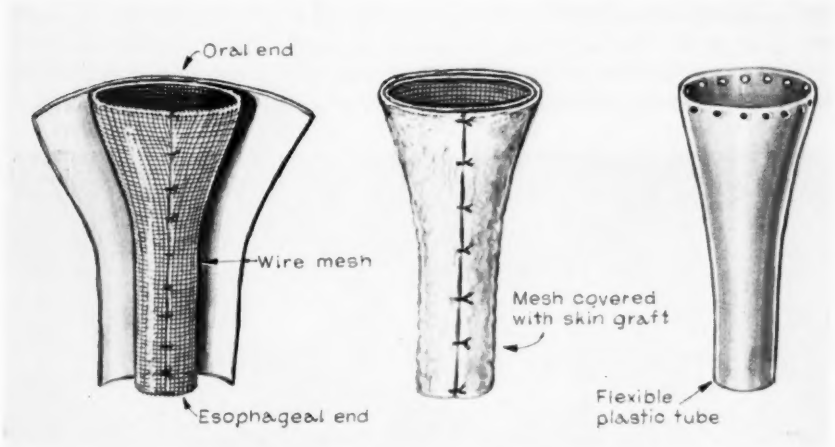

Fig. 6.—Wire mesh and plastic stents for pharyngeal and esophageal skin grafting.

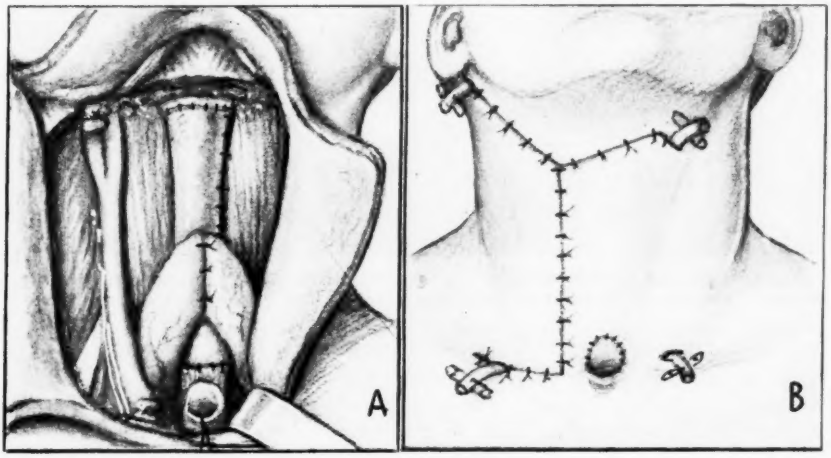

Fig. 7.—*A*, inferolateral portion of graft covered with lobes of thyroid gland. (Superolateral portion of graft is usually covered with associated prevertebral fascia and skin flaps.) *B*, closure of neck wound and tracheostoma.

aspect of the cervical esophagus (Fig. 3) and small, limited pharyngeal cancers which do not critically approach the laryngeal structures. In general, in surgery of the pharynx it is impractical to retain the larynx when it has been necessary to sacrifice the superior laryngeal nerves, epiglottis, and more than half of the hyoid bone. When

these three anatomical elements are destroyed or eliminated in the surgical process, even though the patient still has the ability to use the larynx as an organ of phonation, it is usually impossible for him to carry on normal deglutition without the serious complications associated with frequent aspiration of saliva, food, and drink.

The deficiency created by the previously mentioned surgical procedures (Fig. 4) is immediately corrected by the end-to-end anastomosis of a free, tubed, thick-split skin graft to the pharyngeal and esophageal openings. The free graft should be approximately 1/15,000 to 1/20,000 in. in thickness. It is rolled into a tube 2 cm. in diameter at its esophageal attachment and 4 cm. in diameter for its pharyngeal

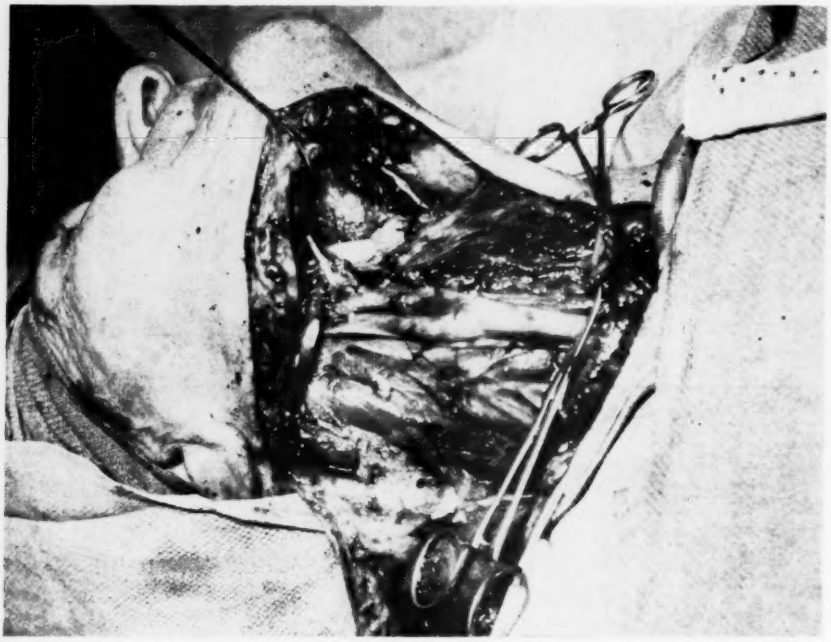

Fig. 8.—Right radical neck dissection, cervical esophagectomy, laryngectomy, pharyngectomy, and partial glossectomy for extensive epidermoid cancer of these areas.

attachment. It is sewed with No. 00 chromatic catgut along its lateral margin. The length of the tube is tailored to accommodate the void between the pharynx and esophagus. The tube is placed in position with its longitudinal suture line in approximation with the prevertebral fascia or unoperated upon portion of the neck. This procedure is to insure a maximum amount of nourishment to the longitudinal suture line and furnish it with the greatest amount of tissue support (Fig. 5).

One of the most important steps in the technique is the careful end-to-end anastomosis of this free skin tube to the circumference of the pharyngeal and esophageal mucosa. The anastomosis is carried out with interrupted No. 00 chromic catgut sutures, and the realignment between the pharynx and esophagus should accomplish an effective elimination of saliva from the neck wound. This elimination has the advantage of preventing a secondary infection of the neck wound caused by

constant flow of saliva over these areas and interfering with nourishment and support to the free graft. It also reduces the enzymic action on the raw surface of the graft and infection of the graft from contaminated saliva.

Original experiences of implanting these free-tubed skin grafts without a stent support indicated that although some patients could eat soft foods without great difficulty, stenosis developed in others. It is well known that all free skin grafts contract to some degree. This fact was compensated for by using a thick-split graft and tailoring it generously. Scarring resulting from inflammation was controlled by biotherapy and adherence to the indications for the operation. In spite of these pre-

Fig. 9.—Immediate reconstruction of pharynx and esophagus by tubed, free, split-skin graft.

cautions, stenosis (not atresia) occurred in some instances. The circular suture line uniting the skin graft to the pharynx and esophagus manifested the greatest contracture. Other causes of contracture were scarring from loss of as little as 5% of the skin graft and dehiscence of two catgut sutures and silk stitch granuloma. In the patients whose scar tissue reaction was hyperactive, and they cannot be differentiated preoperatively from the inactive group, the stenosis presented the problems of restriction to liquid diets and intermittent bouginage. In an attempt to eliminate this unpredictable inconvenience, wire mesh and plastic stents were fashioned and implanted with the skin graft into the neck. Their size and shape must accommodate the wound, or necrosis of the neck tissues and delivery of the stent will occur. The stent is tolerated well and should remain in situ for at least six months. Active scar contracture has abated after this interval. The plastic stent can be removed perorally

without difficulty. The wire mesh stent may heal into the wound if part of the graft has failed to "take" and would complicate its removal. If it is being tolerated normally, it can remain in position; otherwise, it has to be liberated before extraction

A lubricated sterile Levine tube is then passed through the nose and newly formed passage in the pharynx and thence into the esophagus and stomach. The nourishment and covering of the free tubed graft comes from the prevertebral fascia posteriorly. The lobes of the thyroid gland are draped about the inferior, anterior, and lateral surfaces of the dermal part of the graft. The superior, anterior, and lateral portions of the free graft may in most instances be covered with associated prevertebral fascia in the area. Thus, in the majority of cases, it is possible to cover the

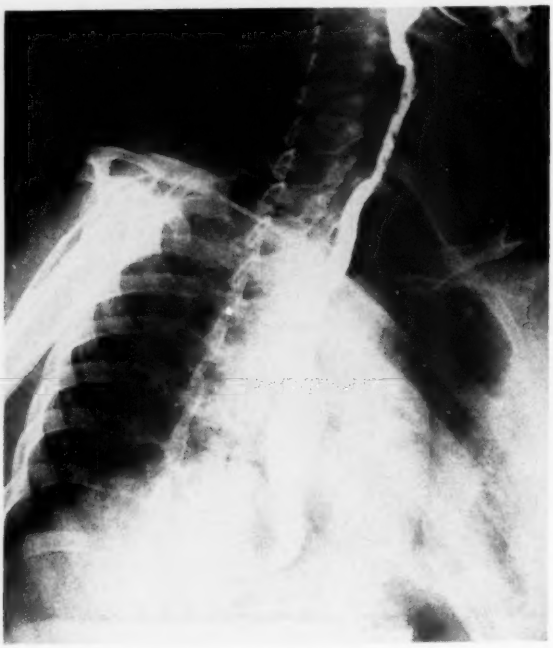

Fig. 10.—Esophagram of patient who underwent illustrated techniques. (Note that lumen of free skin tube has narrowed.)

free inlayed skin graft with vital nourishing tissue elements in the neck. The skin flaps of the neck are then placed over the entire wound and sutured in layers with fine silk. The tracheal stoma is made through a perforation in the medial flap. The wound is adequately drained at its dependent portions (Fig. 7). A sterile pressure dressing is applied in order to accomplish more intimate approximation and fixation to the anastomosed tube of all nourishing elements. All drains are usually removed from the wound at the end of the 10th to the 14th postoperative day, and the patient is given sterile water by mouth. If this is taken without leakage the Levine tube is removed and a liquid diet is given by mouth. If there is a small fistula the Levine tube is permitted to remain in place until the fistula has closed spontaneously (Figs. 8 and 9).

COMPLICATIONS

Complications should be minimal. They may be classified under the headings (1) infection, (2) fistula, and (3) stenosis.

Infection is no commoner than when free skin grafting is attempted in any potentially infected area. Ample biotherapy and elimination of saliva from the wound usually control this situation. Devitalized tissues with poor healing qualities may form a poor postoperative nourishing bed, with subsequently localized areas of necrosis and slough. These areas are prone to infection. Pseudomonas aeruginosa

Fig. 11.—Patient one month after cervical esophagectomy, laryngectomy, pharyngectomy, and left radical neck dissection.

and anaerobic streptococci may be troublesome invaders, with loss of all or part of the graft. These areas should be debrided and a secondary repair carried out.

In the absence of infection, fistula is rare. Small fistulae may appear as a result of stitch dehiscence and minimal loss of graft. These usually close spontaneously within one or two weeks.

Stenosis is the most unpleasant complication, appearing gradually over weeks or months after an apparently successful operation. Armed with the knowledge that contraction of the free graft, hypertrophy of the circumferential scars at the line of anastomosis, and heavy scar formation in the deep areas of the neck are likely to occur, the surgeon may take certain precautions. The grafts are cut generously, thick-split, then covered with a nourishing tissue bed, and protected with biotherapy.

An inert stent is implanted to further prevent the actual contraction which could lead to stenosis. Bouginage may be necessary and is helpful (Figs. 10 and 11). If stenosis occurs 6 to 12 months after the operation, recurrent cancer must be ruled out.

SUMMARY

A one-stage operation for the radical resection of cancer of the cervical esophagus, larynx, pharynx, and lateral part of the neck with immediate reconstruction has been successfully carried out on six patients in the past two years. It is hoped that this one-stage operation will greatly facilitate the management of patients with extensive carcinomas of these areas.

139 E. 36th St.

CHOICE OF OPERATION IN CARCINOMA OF THE LARYNX

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IN ORDER to discuss the choice of operation in the treatment of carcinoma of the larynx, the nomenclature must be defined. There have been many interpretations of the terms "intrinsic" and "extrinsic" lesions of the larynx, but in this article the classifications suggested by T. E. Walsh, of St. Louis, will be used:

I. Intrinsic: Confined to the true vocal cord only

II. Endolaryngeal: Involving structures within the laryngeal box, i. e., the ventricles, ventricular bands, arytenoids, and interarytenoid space and those cancers of the vocal cord which have spread across the anterior commissure

A. Without fixation of the vocal cord or arytenoid

B. With fixation of the vocal cord or arytenoid

C. Histologic grade

III. Subglottic

IV. Extrinsic or Extralaryngeal

It must be remembered that a cancer starting in one area may enlarge and invade another. It is said that the tumors should be classified according to the place of origin, but this is sometimes difficult, since one cannot tell whether a tumor arose in one area and worked its way down or started low and migrated upward. While the origin of a tumor may play some part in the prognosis and may influence only rarely the choice of operation, the principle of complete eradication of the disease still stands.

It would be wise also to review a most important portion of the anatomy of the larynx—the lymphatic drainage (Figs. 1 and 2). It will be noted that the area above the vocal cord is drained by vessels that pierce the thyrohyoid membrane on each side and lead to the upper deep cervical nodes. The region below the vocal cord drains into the prelaryngeal nodes, thence to either the middle and lower deep cervical nodes or the pretracheal nodes, and, possibly, the paratracheal nodes. The vocal cord itself has practically no lymphatics, while above and below it, the lymphatic vessels are very numerous. All this is important in determining the type and extent of the operation required to effect a cure of the patient.

The next consideration is the histology of the tumor—the grade. A cancer that is classified as Grade I or II is a well-differentiated, slow-growing tumor, and its ability to metastasize is delayed. On the other hand, Grades III and IV are less differentiated, highly malignant cancers that spread rapidly through the lymphatics.

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While the grade of a tumor is helpful in determining the type of operation that should be done, it is not always a dependable guide. Slow-growing tumors have been known to metastasize early, and large, less differentiated tumors have been removed with-

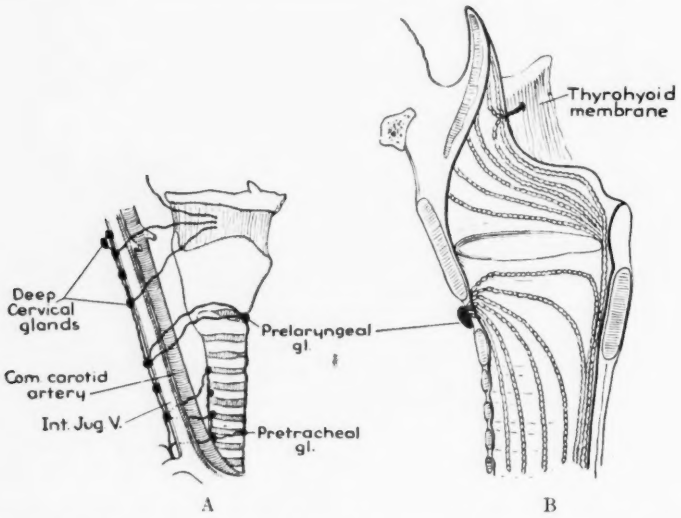

Fig. 1.—Lymphatics of the larynx: *A*, exterior view; *B*, interior view (Kernan).

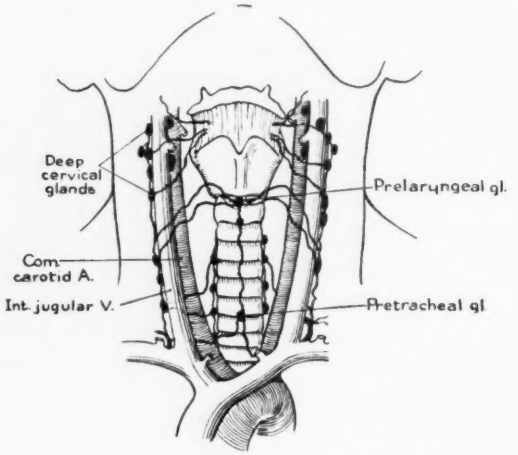

Fig. 2.—Lymphatics of the larynx (Kernan).

out evidence of metastases. Then too, a large, rapidly growing cancer is found to have involvement of the lymph nodes, while a similar tumor may have no extension into the lymphatics. There must be some other unknown factor that is responsible for these variations in behavior. In this regard, Kernan speaks of the "biochemical variations in cancer cells."

Furthermore, the size of the lesion is not a guide, for a large tumor may have no evidence of metastases, while a very small tumor may metastasize early. It should be remembered also that carcinomas may spread through the blood vessels as well as the lymphatics. It is generally true, however, that in any statistical study it is revealed that lesions of the lower grades have a higher percentage of operative cures.

A proper examination of the larynx is most important. All too frequently a patient with hoarseness or a sensation of a lump in the throat or slight difficulty in swallowing is deprived of an early examination because of either neglect on the part of the patient to seek a diagnosis or the failure of a physician to inspect the region below the oropharynx. Obviously, an early diagnosis is very essential, and each patient with laryngeal or pharyngeal complaints warrants an immediate examination with the laryngeal mirror. If no abnormality is seen, or if mirror inspection is not satisfactory even after cocainization, a direct laryngoscopy is imperative. Then the exact extent of the pathology can be determined, and a biopsy specimen is taken.

A biopsy specimen is usually obtained from the edge of the tumor, although on rare occasions this does not show the true pathology. The central necrotic area should be avoided, since the microscopic picture of the latter may not be conclusive. If a biopsy specimen is reported negative for malignant change in a case that is clinically positive, the procedure should be repeated, removing specimens from several areas.

In determining the extent of the tumor, one must keep in mind the possibility of superficial infection that may give the appearance of tumor tissue because of irregularity and swelling. Then, too, a growth may extend beyond the portion of the larynx that can be visualized, or the view may be obstructed by the size of a tumor. A subglottic tumor may be difficult to identify. A cancer may enlarge submucosally or perforate cartilage, intercartilaginous ligaments or membranes, or grow beneath the muscles of the larynx. Leroux-Robert, in an excellent monograph, and Kernan, with serial sections of the larynx, have demonstrated this submucosal extension. Planograms are very helpful in determining the outlines of a growth and should be employed far more frequently.

In carcinoma of the larynx I advocate operative removal as opposed to radiotherapy. Those who employ radiation treatment have reported some good results, but by and large the results are considerably better after operative elimination of the disease. The object is to remove the cancer, and I believe that this is done with far more certainty by operation. It is said, and it is true, that there is only one chance to cure a patient with cancer—the first chance. After that, the outlook is exceedingly doubtful.

Certainly there is some resultant abnormality—i. e., after the laryngofissure operation there is a hoarse voice, after the laryngectomy, there is a loss of voice and replacement of an esophageal voice or instrument, and after neck dissections, there may be other discomfortures, but I have seen great inconvenience from radiotherapy. Dryness of the throat, perichondritis, abscess formation, necrosis of cartilage and soft tissue are very disconcerting and sometimes result in distortion of the larynx, necessitating a permanent tracheotomy and producing a loss of voice. Then too, radiation therapy can be employed only once and cannot be repeated if the full tumor dose has been given.

Of course, there are times when radiation will reduce the size of a tumor, so that an operative procedure becomes possible or the operative removal may not have to be so extensive. As for metastatic carcinoma in cervical lymph nodes, it is now known that radiation therapy is not as effective as operative removal.

Reading through the literature, I have found that surgeons are turning away from radiation therapy, and I believe that it is because these surgeons are becoming more proficient in the operative procedures involved. This is especially true in dealing with extrinsic carcinomas. Of course, the surgeons are greatly helped by modern methods of anesthesia, by present-day understanding of shock, fluid balance, etc., and by antibiotics. I believe that the men capable of performing the necessary operative procedures prefer operation to radiation. Perhaps in the future the pendulum will swing back again, and a formula of the combination of radiation therapy and surgery will give happier results.

The type of operation to employ in a given case should also be discussed. The aim is to eradicate the cancer, eliminate the possibility of recurrence or metastases, and at the same time preserve as much function as possible. But the life of the patient must not be compromised in order to preserve function. True, at times the surgeon must be rather bold in his performance, for only in this way can he hope to remove the disease. It requires a great deal of experience and understanding of the growth of cancer in the larynx to come to a proper decision. Each case must be considered individually, and it is difficult to follow stated rules and maintain classifications.

INTRINSIC CARCINOMA OF THE LARYNX

If the tumor is situated on the midportion of a vocal cord, does not extend forward as far as the anterior commissure, and does not reach the area of the arytenoid, and if the cord is mobile, a simple laryngofissure operation is adequate. The thyroid cartilage is split in the midline, the tumor visualized and readily removed with the inner perichondrium. There should be an adequate margin of at least 1 cm. of normal tissue around the tumor. Such a lesion may also be removed by suspension laryngoscopy and fulguration. This method has been very successful in experienced hands, but I feel more confident of obtaining a cure under the better visualization of a laryngofissure.

If there is any suspicion of deep involvement of the cord, a laryngofissure may be done, removing the thyroid cartilage on the involved side. Immobility of the cord usually indicates involvement of the arytenoid, and hemilaryngectomy or even a laryngectomy may become necessary.

If the tumor extends for a short distance toward the ventricle or toward the subglottic area, a laryngofissure may still be possible. In these cases it may be advisable to excise the thyroid cartilage on the involved side. However, the cervical nodes must always be watched for the possibility of enlargement.

At times the tumor reaches the anterior commissure. Broyles has shown that at this point the fibers of the thyroartenoid ligament extend into the thyroid cartilage, so that there is a tendinous attachment of the anterior end of the vocal cord to the cartilage and an absence of perichondrium in this area. If the anterior commissure is involved, the removal must be very thoroughly done. It is possible to excise the necessary portion of the involved vocal cord and, in addition, a small area of the anterior end of the uninvolved cord to make certain of complete removal. In

these instances I prefer the operation designed by Kemler, in which about 1 cm. of the anterior end of each thyroid cartilage is removed with the specimen. This insures thorough elimination of the cartilage in the anterior commissure as well as the anterior end of the opposite cord. More extensive involvement of both vocal cords has been treated successfully by laryngofissure, but I believe that the surgeon is rarely justified in taking such a chance.

In true cord involvement for which laryngofissure is the treatment of choice, the surgeon is not ordinarily concerned with lymph-node metastases, since there are very few vessels in this area, but patients must be observed for possible spread locally and then for an extension to the nodes.

In laryngofissure frequently a new cord is formed or perhaps a band of scar tissue, so that the patient has a rough but adequate voice. The postoperative course is of short duration. The larynx must be observed for granulation tissue formation, which may require removal by direct laryngoscopy. The denuded portion of the larynx readily epithelizes. As much as a 95%-cure may be expected in these cases if the patients are properly selected and the indications are not stretched beyond reason.

When the tumor involves the cord and extends posteriorly to the arytenoid, I believe that adequate removal can be accomplished by hemilaryngectomy. This is the removal of half the larynx in an effort to preserve function and at the same time remove the disease. Interest in the operation was awakened by Goodyear and Figi, and the procedure was modified by Som. The latter advocates the removal of the thyroid cartilage and tissue on the inner aspect together with the arytenoid. There is sufficient mucosa to cover the denuded area, and an especially designed obturator is placed in the larynx for about 10 to 14 days to prevent contraction of the lumen. I have performed the operation on several occasions and feel that it will become a recognized procedure to be used when the proper indications are present. A more extensive hemilaryngectomy may require the placement of a skin graft to promote healing of the denuded area. This has been demonstrated successfully by Figi.

ENDOLARYNGEAL CANCERS

Tumors that involve the ventricular bands, arytenoids, and interarytenoid spaces, with or without fixation of the vocal cord or arytenoid, are classified as endolaryngeal carcinomas. For the most part, this type of cancer is ideal for laryngectomy. There are times when the ventricle and vocal cord are involved and a laryngofissure will suffice, but usually a laryngectomy is necessary. These tumors when observed in the early stages do not have metastases, but they require constant observation for lymph node involvement, and when this occurs a block dissection of the nodes of the neck is required. If, however, nodes are palpated before laryngectomy or at the time it is done, the dissection is performed as a combined procedure.

Some have advocated radiotherapy as a prophylactic measure after laryngectomy when nodes are not palpable, but I do not feel that this is appropriate, since radiation is not at all successful in eradicating the disease in the nodes.

There are many variations in doing a laryngectomy. Crowe and Broyles have advocated a procedure in which they do a subperichondrial dissection of the thyroid cartilage and retain the strap muscles of the neck. This affords the possibility of closure in many layers, to avert fistula formation. It is a proper and adequate opera-

tion in selected cases, but I have observed that one of the first nodes to be infiltrated, especially in an anterior involvement, is the prelaryngeal node; hence I prefer a wider field of removal, including the perichondrium of the thyroid cartilages and the prelaryngeal muscles. Since the help of antibiotics has become available, the formation of a fistula is no longer as frequent as in the preantibiotic days.

In the type of tumor that involves the upper portion of the larynx, I prefer to include the epiglottis in the removal, and to afford an easier closure I excise a portion of the hyoid bone. However, in some instances the lower border of the cricoid cartilage may be left and sutured to the skin in order to have a more rigid tracheal stoma that will not contract.

The importance of adopting the procedure to the extent of the pathology cannot be overemphasized. Experience and knowledge in handling these tumors are very essential in choosing the operation to be performed. Of some help in making this choice is the determination of the group in which the tumor falls, but this cannot be considered alone.

SUBGLOTTIC CANCERS

Subglottic tumors metastasize readily, indicating a laryngectomy. The prelaryngeal node is involved relatively early because of the numerous lymphatic vessels in the region below the vocal cord. It seems wise therefore to include in the laryngectomy the strap muscles of the neck in order to remove the surrounding lymphatics as far as possible. If, however, the nodes on the involved side are enlarged, a neck dissection must be done at the same time. It should be mentioned that there are times in which such a neck dissection is performed, and the enlarged nodes are found to be inflammatory. The dissection, however, is justifiable, since there is no way of being certain that the enlargement is not malignant. A needle biopsy specimen giving a positive result would make the diagnosis, but if a negative result were obtained, the nature of the condition would still be in doubt.

If the growth extends down toward the tracheal rings, it may be necessary to remove one or two of them. If the tumor involves the cords and the anterior commissure or more, it would be wise to remove the epiglottis. I am inclined to do this routinely. The epiglottis serves no purpose, and I feel safer in removing a wider field.

If the tumor has broken through the thyroid or cricoid cartilages or the cricothyroid membrane, certainly a complete removal of the muscles as well as the nodes on the involved side is imperative.

EXTRINSIC OR EXTRALARYNGEAL CARCINOMA

Carcinomas in this region are usually highly malignant, Grades III and IV, and metastasize readily. This is important in considering the operative procedure necessary to eradicate the disease.

A tumor involving the upper portion of the epiglottis has been removed successfully by suspension laryngoscopy. It must be made certain, however, that the tumor is localized in the epiglottis itself and has not spread to the tongue or the aryepiglottic folds.

Tumors on the anterior surface of the epiglottis are usually more malignant and metastasize readily. Tumors on the posterior surface grow slowly and metastasize later, spreading to the ventricle, aryepiglottic fold or the preepiglottic space.

Cancers of the epiglottis have been removed by the laryngofissure route, since the epiglottis is readily accessible through the split thyroid cartilage. Another operation is the so-called transhyoid approach, in which the hyoid bone is split, the midportion of it removed, and the pharynx entered in this area. However, I have observed at least two cases in which the epiglottectomy was unsuccessful because of aspiration of food into the lung. In these cases there must have been some interference with the nerve supply.

It must not be forgotten that the likelihood of extension of the tumor to the preepiglottic space and tongue anteriorly and to the aryepiglottic folds posteriorly is very great. The preepiglottic space is especially important, for the tumor may extend from the vestibule of the larynx anteriorly through a weak elastic wall on each side of the epiglottis. This is the posterior wall of the preepiglottic space. The tumor may also perforate the epiglottis. The lymphatics of the base of the epiglottis and the anterior portion of the ventricular areas pass through the preepiglottic space and pierce the thyrohyoid membrane on each side. Since the preepiglottic space is readily invaded and at times this invasion cannot be recognized clinically, it is necessary to consider its involvement whenever one is dealing with carcinoma of the lower portion of the epiglottis or of the vestibule of the larynx. Therefore a complete laryngectomy and removal of the preepiglottic space are indicated. The latter is done by entering the pharynx above the hyoid bone, so that the epiglottis, hyoid bone, preepiglottic space, and larynx are removed in one specimen (Bisi's preepiglolaryngectomy). The tumor, too, may creep over to the piriform sinus area, and this must be included in the excision. On the other hand, a growth may begin in the aryepiglottic fold or ventricle and extend to the side of the epiglottis or the piriform sinus.

When there is such extensive involvement, the likelihood of metastases to the cervical nodes is very great; hence even if the nodes are not palpable, a neck dissection should be performed on the involved side. If the nodes on both sides are involved, one is compelled to do a bilateral neck dissection, attempting to remove the internal jugular vein on only one side. Because this is a rather lengthy and arduous procedure, perhaps more wearing on the surgeon than on the patient, many prefer to remove the nodes on the more involved side at the first operation and in a few weeks perform the dissection on the other side of the neck.

The block dissection should include the sternomastoid muscle, the internal jugular vein, the ribbon muscles, and submaxillary gland—everything except the carotid, vagus, and hypoglossal nerves.

Trotter has devised, and later Orton advocated, a lateral transhyoid or transthyroid pharyngotomy as a means of approach to a lesion in the piriform sinus, epiglottis, base of the tongue or lateral pharyngeal wall. In this operation the lateral portion of the hyoid bone and the posterior part of the thyroid cartilage are removed after a neck dissection has been done. The tumor can be palpated, and then its extent is brought into view to facilitate complete removal. Frequently it is necessary to leave a pharyngostome, which is closed at another time.

Alonso, of Montevideo, has advocated more conservative procedures in an effort to retain the function of the larynx. He has devised a so-called partial ventral laryngectomy for small or moderate-sized tumors of the piriform sinus and a partial horizontal laryngectomy for tumors of the epiglottic vestibule. These operative procedures may be combined with neck dissections. They are certainly steps in the right

direction, but until surgeons become more proficient in these procedures and until the results become more promising, it seems safer to remove the entire larynx when at all in doubt as to the extent of the involvement. The likelihood of submucosal spread is great in extrinsic malignant tumors. Skill in determining the proper case for these procedures is most imperative. The life of the patient must not be compromised in the attempt to preserve the voice.

In general, then, an extrinsic carcinoma of the larynx requires complete removal together with a neck dissection on the involved side.

There are times when a tumor is so extensive that its operability is impossible. Here radiation therapy may shrink the tumor to such a size that it becomes possible to remove the remaining lesion surgically.

SUMMARY AND CONCLUSIONS

I have attempted to discuss the choice of operation in carcinoma of the larynx. This depends, first, upon the position and extent of the involvement and, second, upon the malignancy or rapidity of growth of the tumor. I have presented various operations that are advocated and expressed my preference. Each case must be carefully considered and the appropriate operative procedure applied. Function should be preserved whenever possible but not at the expense of a cure. I feel that whenever it is feasible, a tumor should be surgically removed, since this seems to be the more certain way of eradicating the disease. The more extensive the tumor, the less likely it is to be cured by radiation therapy. Therefore the patient's only hope is surgical removal whenever possible. The patient is entitled to that chance.

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BASAL-CELL CARCINOMA OF THE EXTERNAL AUDITORY CANAL AND MIDDLE EAR

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SQUAMOUS-CELL carcinoma is the most frequent malignant tumor of the ear. Broders [1] analyzed a series of 63 cases of epithelioma of the ear and found that the squamous-cell type was present in 62% of the cases; the basal-cell type, in 33%, and the melanotic type, in 2%. The auricle was involved in 85% of the cases; the external canal, in 14%, and the middle ear, in 2%.

This article deals with three cases of basal-cell carcinoma which were studied by my associates and me. Two cases have been reported by Grabscheid [2] and Novak [3] respectively and are briefly mentioned in this article. In addition I have reported a case of my own. The term "basal-cell carcinoma" is used in the broad sense, including epithelial tumors which are not classified as squamous-cell carcinomas, in other words, tumors which are supposed to originate in the basilar layer of the epidermis and its appendages or in the salivary glands.

Novak reported a case of such a tumor. Mrs. B. N., age 75, had noticed a tumor growing from her right ear for four years. In the beginning she had severe pain but no discharge, and her hearing was equally good in the two ears. The tumor finally filled the external canal. It bled at times. At admission there was a large beefy tumor protruding from her right ear; the hearing was correspondingly diminished on that side. No cervical nodes were palpable, and the general physical examination revealed the patient to be in good physical health. A biopsy specimen was taken, and the diagnosis of a basal-cell carcinoma, sweat gland type, was made. At the radical mastoid operation the middle portion of the posterior wall of the bony external canal was observed to be replaced by tumor tissue. The tumor was easily removed from the anterior and inferior walls of the external canal but was attached to the superior and posterior walls. At this site the tumor came away with the surrounding skin. A small amount of mucopus, necrotic bone, and granulation tissue was found in the pneumatic cells of the mastoid, in the antrum, and in the attic. In the anterior wall of the tympanic cavity there was a small sequestrum, and the Eustachian tube was patent. Microscopic examination revealed that there was no tumor in the tympanic cavity. At this time the diagnosis was changed to minor salivary gland tumor with cylindromatous features.

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1. Broders, A. C.: Epithelioma of the Ear: Study of 63 Cases, S. Clin. North America **1**:1401, 1921.

2. Grabscheid, E.: Adenocarcinoma Involving the Middle Ear, Arch. Otolaryng. **37**:430, 1943.

3. Novak, F. J., III: Salivary Gland Tumor of the Middle Ear and Paget's Disease (Osteitis Deformans) of the Skull, Arch. Otolaryng. **45**:477, 1947.

Instances similar to the presented case were reported by Neumann,[4] Peele and Hauser,[5] Lukens,[6] Fraser,[7] Tyler,[8] Ahlbom,[9] and others. In all of the cases reported the tumor arose from the basal layer of the skin, from the sweat ("ceruminal" [10]) glands or from the sebaceous glands of the external canal. There is no sharp distinction between basal-cell carcinomas arising from the epidermis and those arising from the pilosebaceous follicles or sweat glands.[11] It is likely that all of these tumors first develop in the cartilaginous portion of the canal. This is a proved fact in the case of tumors arising from the sweat glands, because sweat glands are found particularly in the cartilaginous external canal and diminish abruptly in number toward the mesial portion of the external canal. The tumors form large masses which protrude from the external canal and are firm, even hard, in consistency. There is usually no excessive bleeding. Ulcus rodens, which is the most frequent manifestation of basal-cell carcinoma of other parts of the skin, is less frequent in the external canal. Microscopically these tumors may present the reticulated or the adenoid type of basal-cell carcinoma.

The tumors grow slowly over a period of years toward the opening of the external canal until they fill up the cymba conchae. They usually do not invade the cartilage, but they may invade the bone of the external canal. They do not cause metastases. From the clinical point of view, the most important question is whether or not these tumors invade the middle ear. Marx [12] asserts that they do not. In this respect the case reported by Novak is instructive. It proves that these tumors eventually do grow mesialward toward the bony canal. In this area they may invade the underlying bone because bone, unlike the cartilage, does not yield to the pressure of the tumor. However, even in this case no tumor tissue has been discovered in the middle ear. For this reason the original diagnosis, "basal-cell carcinoma, sweat gland type," is more in keeping with the clinical findings than the diagnosis "minor salivary gland tumor with cylindromatous features," which was later established. Novak's case as well as the cases of Neumann,[4] Peele and Hauser,[5] and Lukens [6]

4. Neumann, H.: Zylindromatoeses Basalzellenkarzinom des aeusseren Gehoerganges, Monatsschr. Ohrenh. **71**:1127, 1937.

5. Peele, J. C., and Hauser, G. H.: Primary Carcinoma of the External Auditory Canal and Middle Ear: Review of the Literature; Report of a Case of Cystic Adenoid Epithelioma (Brooke's Tumor) of the External Auditory Canal, Arch. Otolaryng. **34**:254, 1941.

6. Lukens, R. M.: Adenocarcinoma of the External Auditory Canal, Ann. Otol., Rhin. & Laryng. **45**:567, 1936.

7. Fraser, J. S.: Malignant Disease of the External Acoustic Meatus and Middle Ear, J. Laryng. & Otol. **45**:636, 1930.

8. Tyler, A. F.: Malignant Degeneration of Parotid Cell Nest in the External Auditory Canal, Nebraska M. J. **10**:431, 1925.

9. Ahlbom, H. E.: Mucous- and Salivary-Gland Tumours: Clinical Study with Special Reference to Radiotherapy; Based on 254 Cases Treated at Radiumhemmet, Stockholm, Acta radiol., Supp. 23, p. 1, 1935.

10. The term "ceruminal glands" is a misnomer, because the solid part of the cerumen is produced by the sebaceous glands and not by the "ceruminal glands" which are modified sweat glands.

11. Willis, R. A.: Pathology of Tumours, London, Butterworth & Co., Ltd., 1948.

12. Marx, H.: Die Geschwuelste des Ohres, in Handbuch der speziellen pathologischen Anatomie und Histologie, edited by F. Henke and O. Lubarsch, Berlin, Springer-Verlag, 1926. Vol. 12, p. 490.

seem to indicate that the statement of Marx [12] is correct, viz., that these tumors do not invade the tympanic cavity. This concept is likewise supported by a case reported by Fraser.[7] In this case there was a basal-cell carcinoma of the external canal of long duration. The tumor invaded the skin of the mastoid and apparently extended through the temporal squama into the temporal lobe. Yet there was no tumor in the antrum and middle ear. Similar findings were obtained in a case of Ahlbom's.[9] To summarize, basal-cell carcinoma of the external canal does not invade the tympanic membrane and the tympanic cavity for a long period. It is not certain that the carcinoma invades the tympanic cavity at all. For this reason the radical mastoid operation performed in Novak's case was apparently unnecessary.

The chief symptoms in these cases are pain and diminution of hearing. Bleeding does occur but is not conspicuous. The treatment consists of excision of the tumor and irradiation subsequently to surgery. The outlook is dubious. Recurrences do appear in the external canal and skin surrounding the ear. In the final stage there is involvement of bone and brain. The recurrences may occur within several weeks, but it is more in keeping with the character of the disease that several years pass until the patient succumbs to the involvement of the brain.

The findings in Grabscheid's case differed from those in Novak's case.

He reported that Mrs. E. H., age 47, had noticed diminution of hearing and intermittent pain in the left ear about five weeks prior to admission. An otologist made the diagnosis of acute otitis media. There had been no discharge from the ear previously. At admission there was a grayish-red, firm tissue in the mesial portion of the left external canal. There was no discharge, and the hearing was diminished on both sides. A biopsy specimen taken from the external canal revealed adenocarcinoma. There was no involvement of the regional lymph nodes. At the radical mastoid operation the antrum and tympanic cavity were filled with granulations, which were found to be adenocarcinoma. The incus was normal; the handle and the short process of the malleus were destroyed. The tube was blocked by granulations, but there was no frank pus. Massive doses of radiation were given, and there was no recurrence or metastases in four years after the operation.

REPORT OF A PERSONAL CASE

The patient was a 53-year-old white woman, whose history dated back to July, 1944. At that time she had complained of a sharp, "cutting" pain in the right ear which would start gradually, increase in severity, reach a maximum in two to three hours, and persist from five to six hours. The pain would radiate to the right mandibular angle, down to the neck and, on several occasions, extend to the right clavicular region. These attacks would appear at monthly intervals, the longest asymptomatic period being about three months. During one of these attacks, in October, 1944, the patient noted a partial paralysis of the right side of her face which seemed to improve in the following months but developed into a complete facial paralysis during another attack in February, 1945. Her past history revealed that a diagnosis of syphilis was made in 1927 for which she received a course of treatment. Repeated blood and spinal fluid examinations gave negative results, the last examination having been made in February, 1945.

In February, 1948, the patient stated that she had contracted a "cold" and that on the following day her right ear had begun discharging a purulent material. She was examined three weeks after the symptoms were noticed, and on March 11, 1948, an examination revealed a complete facial paralysis on the right side with impairment of taste on the same side and a right external canal which was completely occluded by a tissue containing brownish granulations. The examination of the left ear and the remaining physical examination were essentially negative. The

patient was able to hear conversational voice at a distance of 20 ft. (610 cm.) with either ear, whispered voice at a distance of 15 ft. (457 cm.). In Weber's test the sound was lateralized to the right, and the Rinne test was positive on both sides; the bone conduction was shortened on the right side. There was a spontaneous nystagmus to the left; there was no fistula symptom and the caloric test was normal on both sides. An audiogram revealed a slight diminution of hearing for all tones on the right side. Microscopic examination of the granulations in the right external canal revealed necrotic tissue. After a biopsy specimen was taken, the right tympanic membrane could be visualized; the anterior half of the drum, including the malleolar handle, appeared thickened and white, and the posterior-inferior quadrant of the drum was covered with friable granulations. An x-ray of the mastoid process revealed a slight haziness overlying the right mastoid cells, with a slight loss of the clear-cut appearance of the cell walls in comparison with the left side. An x-ray of the chest revealed a healed fibrotic tuberculosis of the left apex. Rounded areas of calcific density were scattered throughout the right lung field and right hilus. The trachea, diaphragm, and bony thorax were normal. The cardiovascular silhouette was not unusual.

Clinical Course.—Changes in the lung fields were consistent with old fibrotic tuberculosis; there was no evidence of active lung pathology. The laboratory findings were normal. On March 13, 1948, a radical mastoid operation was performed. The mastoid was rather cellular in structure. The bony posterior wall of the external canal was taken down and the bone was found to be fragile. Its removal revealed the knee of the facial nerve and a tumor which extended from the knee through the stylomastoid foramen. The tumor had broken through the anterior wall of the facial canal and had invaded the tympanic cavity and the floor of the bony external canal. The tumor could be approached rather easily from the facial canal and was removed with a portion of the facial nerve which extended above the oval window and had not been enveloped by the tumor. The posterior wall of the dome of the jugular bulb was damaged, and the hemorrhage was controlled by packing. Distally the tumor seemed to merge with the parotid gland; it was difficult to distinguish between the neoplastic and the glandular tissue, which was severed as far distally as possible, probably including some of the parotid gland tissue. On the inferior surface of the horizontal semicircular canal, a shallow impression had been made by pressure from the tumor and the long process of the incus and the malleolar-incudal articulation had been destroyed. The head of the stapes and its crura formed a small sequestrum which was adherent to the tumor and was removed with it. The footplate of the stapes did not come away. Embedded within the tumor were the chorda tympani and the tendon of the tensor tympani muscle. The malleus was normal, and the subiculum of the promontorium was destroyed, causing an exposure of the basilar portion of the cochlea. There was some tumor tissue present within the hypotympanum, the removal of which exposed a large orifice of the tube.

The postoperative course was uneventful. The postauricular incision was closed by surgery approximately four weeks after the initial procedure, at which time several pieces of tissue were removed for biopsy from the mastoid cavity and reported as granulations. In view of the pathology report, an attempt was made to locate any other possible primary source of the lesion, but a work-up, which included a barium x-ray of the gastrointestinal tract, gastroscopy, pyelograms, and gynecological, neurological, and medical examinations in addition to x-rays of the skull and long bones, revealed essentially negative results. The patient was dismissed.

From May to July, 1948, the patient received 4,500r of x-rays to the ear. In May, 1949, facial plastic operation was performed. In November, 1949, the right external canal was filled with crusts and purulent discharge. The skin of the posterior wall of the canal had developed into an ulcer. Infra-auricularly, in the area of the mastoid process, there were two firm masses. The masses were removable. Biopsy revealed adenocarcinoma. A reoperation on the ear and a radical neck dissection were performed. On Aug. 18, 1952, the patient's daughter reported that her mother was doing very well. She had not missed a day of work. She weighs 140 lb. (63.5 kg.) and has gained 20 lb. (9.1 kg.) since 1948.

Microscopic Examination.—The tumor of the facial nerve, fragments of the mastoid process, granulations from the hypotympanum, and the removed portion of the stapes were examined.

The surface of the tumor of the facial nerve was necrotic. The stroma consisted of firm connective tissue with the normal number of nuclei and small number of capillaries. There were several capillary hemorrhages and regressive changes, such as hyaline degeneration, necrosis, deposits of calcium, and formation of new bone.

Embedded in the stroma were tumor noduli which increased markedly in number toward the stylomastoid foramen. The tumor cells were cubical, possessing large nuclei and small amounts

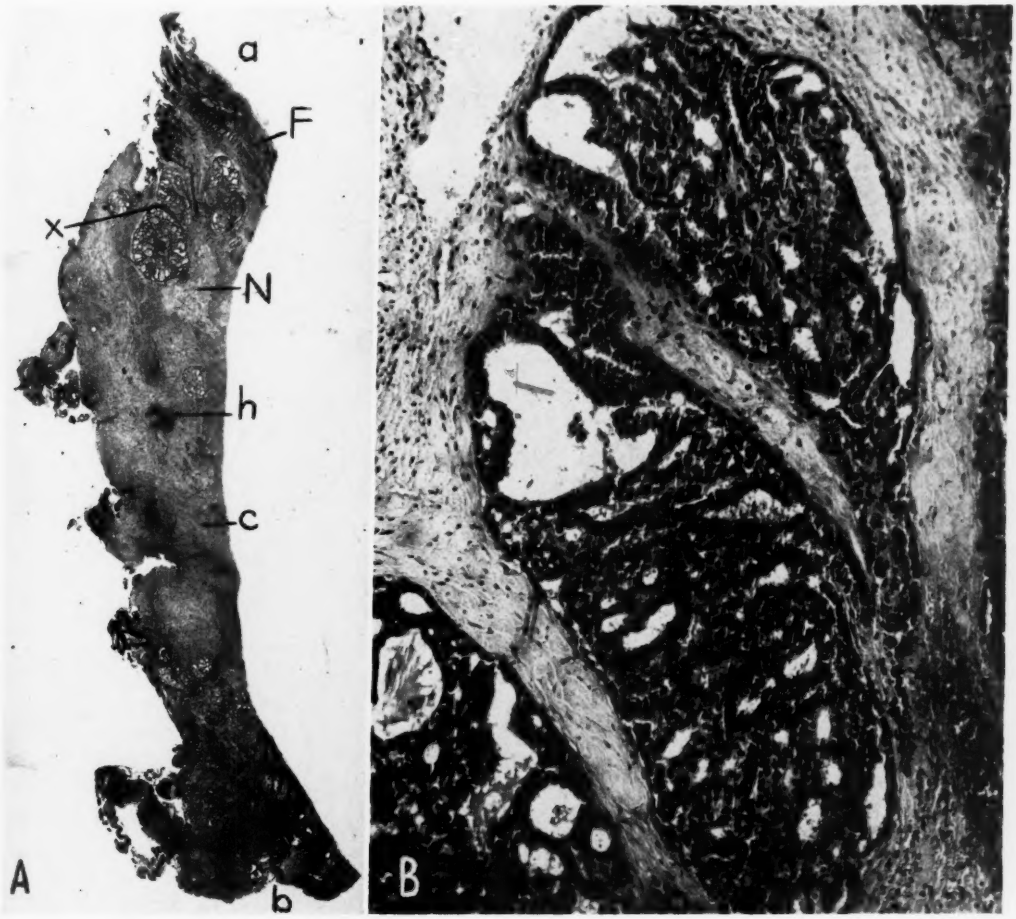

Fig. 1.—*A*, longitudinal section through the facial nerve (*F*) removed at operation; *a*, proximal end of the nerve (from above the oval window); *b*, distal end of the nerve; *c*, connective tissue; *h*, hemorrhage; *N*, remnants of degenerated neural tissue within the tumor; *B*, higher magnification of area *x* shown in *A*.

of protoplasm. In some areas the cells were necrotic. They did not rest on a definite basement membrane and formed one or two rows. The cells were arranged in tubuli or acini, infrequently in papillomatous structures. The acini and tubuli were empty or filled with hyaline masses and some erythrocytes. Tumor cells were noted in the lymph vessels and blood vessels and in the cleavages of the connective tissue. There were only small remnants of the facial nerve, and these nerve fibers were degenerated (Fig. 1).

The mastoid process was pneumatic and diploic. The pneumatic cells showed an edematous mucosa. The lumen was empty. The marrow spaces were filled with a loose network of fine connective tissue containing a small number of capillaries. Within the marrow spaces there were glandular structures lined by pleomorphic and anaplastic tumor cells. Surrounding these accumulations of tumor cells a reactive bone formation was noted.

Fig. 2.—Stapes expelled as a sequestrum.

Granulations from the hypotympanum were also examined. The polypoid fragments were lined by a stratified squamous epithelium which was somewhat hyperkeratotic and markedly irregular with elongated rete pegs. Some down-growths of epithelium were extremely long, and there were islands of fairly well differentiated cells producing epidermal pearls deep in the underlying tissue. The stromal tissues were partly fibrous with many areas of hemorrhage, and in one area there were many cells of the "foam-type" with small nuclei and abundant, clear, ground-glass cytoplasm. In one area there was a tumor nodulus in the connective tissue which was partially destroyed by a recent hemorrhage.

The stapes consisted of a head, the two crura, and a small part of the footplate. It was formed by necrotic bone and necrotic cartilage. Within the head there were marrow spaces filled with fine connective tissue, strands and clusters of tumor cells (Fig. 2).

The preoperative diagnosis of neurinoma of the facial nerve was changed to adenocarcinoma of the right ear with invasion of bone.

COMMENT

The outstanding manifestations in Grabscheid's case and in mine were pain and the discovery of tumor tissue in the middle ear and external canal. In my case the tumor tissue in the external canal was partially necrotic. In neither case did the tumor extend into the cymba conchae as it did in the case reported by Novak. In addition, facial paralysis occurred in my case and in the case of Furstenberg.[13] In neither case was there a history of chronic purulent otitis media of long standing, and in neither case was pus or cholesteatoma found in the middle ear at the time of operation. In the cases of Lange,[14] Furstenberg,[13] Heschelin,[15] and Gritti,[16] however, there was a history of otitis medial purulent chronica. In Grabscheid's case and in mine there was a good pneumatization of the mastoid process. In both instances the tumor occupied particularly the area of the hypotympanum and extended toward the mesotympanum. However, in the case of Grabscheid, the tube was blocked by tumor tissue, and the handle and short process of the malleus were destroyed. The incus and stapes were normal. In my case the tube was open and the malleus was normal; but the long process of the incus was destroyed, and the greater part of the stapes had changed into a squestrum. In my case the tumor had also destroyed the subiculum of the promontory, probably exposing the endosteum of the basilar portion of the cochlea. Despite these changes, the hearing was only slightly diminished, the caloric test was normal, and there was no sign of a fistula. This is probably due to the slow rate of tumor growth and the absence of a virulent infection in the middle ear. To summarize, in the case of Grabscheid the tumor occupied the anterior portion of the hypotympanum and mesotympanum, and in my case, the posterior portion.

In both instances, no local recurrences and no tumor in other parts of the body were discovered for three and four years respectively. This indicates that in both instances the neoplasms were actually primary tumors of the ear and not metastatic tumors, because during that time a primary tumor in another part of body would have become evident. The treatment consisted of surgery and irradiation therapy. In my case a reoperation and a radical neck dissection had to be performed one year after the first operation.

CONCLUSIONS

From the practical and theoretical point of view, two types of basal-cell carcinoma of the ear can be distinguished: one represented by Novak's case and another represented by Grabscheid's case and by mine. These two types differ in several respects.

13. Furstenberg, A. C.: Primary Adenocarcinoma of the Middle Ear and Mastoid, Ann. Otol., Rhin. & Laryng. **33**:677, 1924.

14. Lange, W.: Ein Fall von primärem Zylinderzellenkarzinom des Mittelohres, Ztschr. Ohrenh. **46**:209, 1904.

15. Heschelin, A.: Primärer Krebs des Mittelohres, Acta oto-laryng. **7**:412, 1924.

16. Gritti, P.: Adeno-carcinoma dell'orecchio medio, Oto-rino-laring. ital. **4**:503, 1935.

In the first type the bulk of the tumor is in the external canal. At present, there is no evidence that these tumors invade the middle ear. In the second type there is invariably tumor tissue in the tympanic cavity, and there is frequently an additional infection of the middle ear.

It could be assumed that in the second type, the tumor had originated in the external canal and had grown into the middle ear. This concept is certainly not correct as far as the cases reported by Grabscheid and me are concerned. In Grabscheid's case, an otologist made a diagnosis of an acute otitis media five weeks prior to the patient's admission. Considering this diagnosis, made by a well-trained otologist, it must be fairly assumed that at that time there had not been a tumor mass in the external canal. Five weeks later there was a comparatively small tumor in the external canal and a large tumor mass in the middle ear which blocked the tube and destroyed a portion of the malleus. According to these findings, it is evident that in this case the tumor must have originated in the middle ear. In my case there was a comparatively large mass in the external canal, but this mass was necrotic to a great extent. In contradistinction, there was a great amount of active tumor tissue in the middle ear, pointing to the middle ear as the origin of the tumor. In addition, the bone of the external canal was fragile but was not replaced by tumor tissue as in Novak's case. However, there was a large tumor within the facial canal. This again points to the middle ear as the origin of the tumor.

Another finding is likewise in favor of my concept. In Grabscheid's case and in mine the bulk of the tumor was in the hypotympanum. In Novak's case a considerable number of inflammatory granulations were noted in the attic. This can be explained by the fact that the basal-cell carcinoma of the middle ear arises from the hypotympanum or close to it. The basal-cell carcinoma of the external canal extends in the direction of the middle ear. Here the tympanic membrane (similar to the dura) offers a considerable resistance, as mentioned before. The bone of the lateral wall of the attic, however, may respond to the approaching tumor with mild osteitis, resulting in the formation of inflammatory granulations within the attic.

A primary tumor of the middle ear may run a latent course as long as it is hidden in the hypotympanum. Finally, however, it may extend into the facial canal and cause a facial paralysis and/or break through the tympanic membrane and grow into the external canal. The duration of the disease determines how far the primary tumor advances into the external canal; it never extends into the cymba conchae, because it becomes necrotic before reaching the cymba. The necrosis is due to the fact that the portion of the tumor which fills the external canal is remote to the source of the tumor which is the hypotympanum. The tumor may also grow into the mastoid process or through the anterior wall of the middle ear and the Glaserian fissure into the mandibular joint or in other parts of the temporal bone. In the long run it invariably is associated with an infection, and this increases the danger of this type of tumor. In fact, the patients of Lange,[14] Heschelin,[15] and Rosenwasser [17] died of primary tumors.

However, there are, on the other hand, several cases on record in which cures were achieved. Cases of this type were reported by Furstenberg [13] and Gritti.[16]

17. Rosenwasser, H.: Neoplasms Involving the Middle Ear, Arch. Otolaryng. **32**:38, 1940.

The cases reported by Grabscheid and me belong in this same group. In all of these cases the treatment of choice has been a radical mastoid operation and irradiation therapy. In my case a radical neck dissection had to be performed.

To summarize, from the clinical point of view the existence of a primary basal-cell carcinoma of the external auditory canal and middle ear must be recognized. The next question concerns the pathology of these tumors. The basal-cell carcinoma of the external canal originates in the basal layer of the epidermis or in the sweat glands in the external canal. The pathology of the basal-cell carcinoma of the middle ear, however, is by no means completely understood. Furstenberg [13] believes that these neoplasms represent "a teratoid disturbance of development with blastomatous transformation." This is a hypothesis and is expressed by the author as such. Grabscheid [8] quotes Politzer who states that occasionally there are glands in the mucosa located close to the tympanal opening of the Eustachian tube. Grabscheid believes that in his case the tumor may have originated from these glands. This view cannot be held regarding the findings in my case, proving that the tumor may involve particularly the posterior part of the tympanic cavity where the glands are invariably absent and may spare the area of the tubal ostium.

The tumor in the case of Lange [14] had been examined microscopically. In Lange's opinion the tumor arose in the area of the mesial portion of the Glaserian fissure (similar to the case of Gritti) [16] at the junction of the osseous and cartilaginous Eustachian tube. The carotid artery ran through the tumor, and the jugular bulb was filled with tumor masses. Lange is not certain about the origin of the tumor. He believes that it may have originated from the epithelial lining of the tympanic mucosa. I do not agree with this view, because there was a considerable amount of mucus in the tumor tissue. This points to glandular structures as the site of the tumor's origin and not to the epithelial lining of the tympanic cavity, which may eventually contain cylindrical cells but never goblet cells.

It is evident that neither hypothesis is convincing, viz., neither the few glands in the tympanal mucosa nor the epithelial lining of the mucosa are structures which may serve as places of origin in all cases of primary basal-cell carcinoma of the middle ear. In this respect, another structure deserves closer attention—the aberrant portion of the parotid gland which I discovered in the adventitia of the jugular bulb.[18] The aberrant salivary gland tissue may be found in the lips, cheeks, palate, nares, and pharynx and in the skin of the face and neck. I noticed aberrant parotid tissue of considerable size in the wall of the jugular bulb, immediately below the floor of the middle ear in a case of metastatic tumor of the petrous bone (Figs. 3 and 4). In this case the aberrant salivary gland tissue consisted of large cells with indistinct margins, small vesicular nuclei, and small amounts of chromatin. The cells formed alveoli and glandular structures which were surrounded by strands of connective tissue. There were a small number of blood vessels, but there were no nerves. The entire structure was wrapped in a comparatively thick capsule of connective tissue. The capsule approached the endothelium of the jugular bulb.

The structure is located in the same area as the glomus jugulare (Guild [19]). Nevertheless, it is not the glomus jugulare. The two structures are entirely differ-

18. Brunner, H.: Metastatic Tumor of the Temporal Bone, Arch. ital. otol., to be published.

19. Guild, S. R.: A Hitherto Unrecognized Structure, the Glomus Jugulare, in Man, Anat. Rec. (Supp. 2) **79**:28, 1941.

ent. They differ in the following ways: (1) the presented structure has a glandular appearance and not the appearance of a paraganglion; (2) it has only a small amount of blood vessels, and there are no nerves; (3) it is wrapped in a thick connective tissue capsule, and (4) it has no relationship to the petrosal nerve.

In order to understand the topography of the presented structure, it must be recalled that the major portion of the parotid gland is located behind the mandible in an area the posterior wall of which is formed by the sternocleidomastoid muscle, the mastoid process, and the external auditory canal, while the floor is formed by

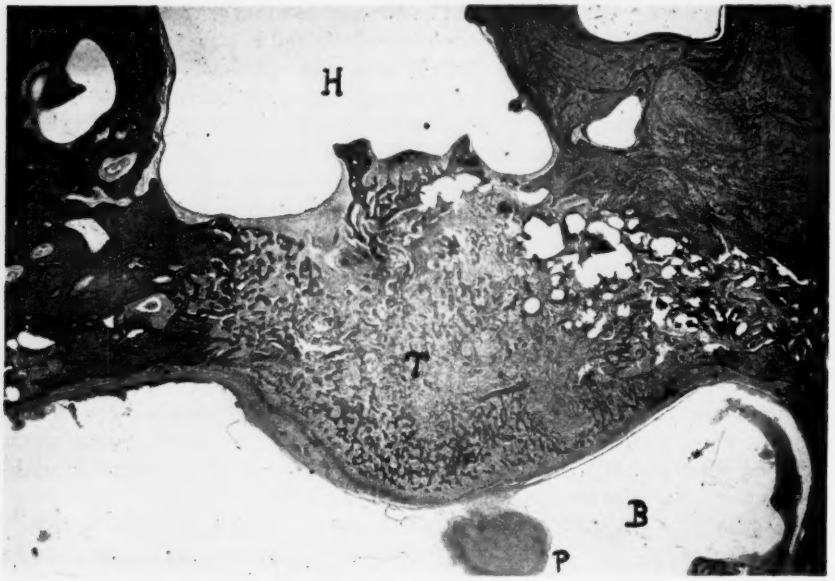

Fig. 3.—*B*, jugular bulb; *H*, hypotympanum; *P*, aberrant salivary gland tissue of the parotid; *T*, tumor of the floor of the middle ear.

the styloid process and the muscles invading this area. In this way the parotid gland may approach the jugular bulb, which occasionally extends laterally into the floor of the external canal.[20] Considering this relationship, it seems plausible that displaced portions of the parotid gland may be noticed occasionally in the wall of the jugular bulb. I did not find a report concerning this aberrant salivary gland tissue. This may be due to the fact that displaced portions of the parotid gland in the wall of the jugular bulb are by no means frequent and that the jugular bulb is often absent in microscopic specimens of the ears.

It is a fair conclusion that the aberrant salivary gland tissue may serve as the site of the origin of an adenocarcinoma, which may break through the floor and grow into the middle ear. In support of this concept is the finding that in these

20. Baily, H.: The Surgical Anatomy of the Parotid Gland, Brit. M. J. **2**:245, 1948. Baily claims that a prolongation of the deep lobe of the parotid gland plunges behind the posterior border of the mandible toward the styloid process, which it surrounds and that the prolongation may be adherent to the jugular vein near its bulb.

cases the greatest amount of tumorous tissue is usually noticed in the hypotympanum. This is particularly true in the case reported by me. In this case the dome of the jugular bulb had been broken through by the tumor, and the tumor seemed to merge with the parotid gland. Microscopically the noduli of the tumor increased sharply toward the stylomastoid foramen, viz., toward the area of the parotid. To summarize, a great number of primary tumors of the tympanic cavity are actually tumors of the parotid gland which originate from aberrant salivary gland

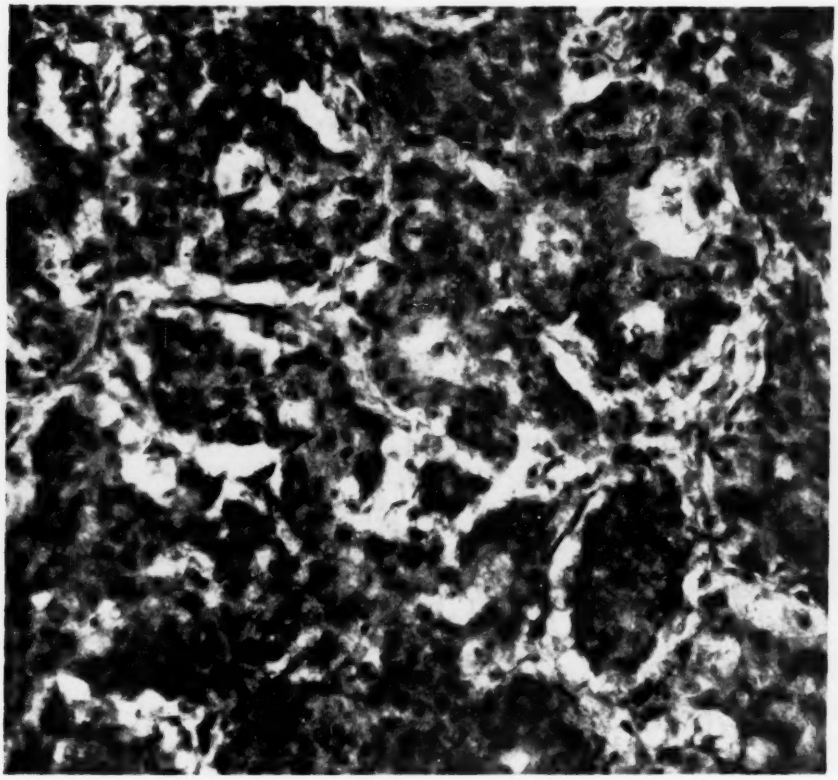

Fig. 4.—Higher magnification of aberrant salivary gland tissue.

tissue in the wall of the jugular bulb and invade the middle ear. In this respect the tumors are analogous to the "glomus-tumors" of the tympanic cavity which likewise originate from aberrant paraganglionar tissue in the area of the jugular bulb. Both types of aberrant tissue are by no means regular findings. So far as the "glomus jugulare" is concerned, Krause [21] and, prior to him, other anatomists, have presented a very good description of this tissue. Nevertheless, Watzka [22] claimed that a "paraganglion tympanicum," viz., glomus jugulare" does not exist.

21. Krause, W.: Die Glandula tympanica des Menschen, Zentralbl. med. Wissensch. **16**:737, 1878.

22. Watzka, M.: Paraganglion tympanicum? Anat. Anz. **74**:241, 1932.

The examinations of Guild [19] have proved that a "glomus jugulare" does exist, although it seems that it is usually inconspicuous. The same holds true for the aberrant salivary gland tissue. This is in agreement with the comparative rarity of the tumors originating from these aberrant and rudimentary structures.

From these findings the practical conclusion can be drawn that a radical excision is not possible in "glomus-tumors" or in primary adenocarcinomas of the middle ear. Nevertheless, there are several cases on record in which cures were achieved for several years, perhaps permanently.

SUMMARY

Two types of basal-cell carcinoma of the ear can be distinguished; basal-cell carcinoma of the external auditory canal and basal-cell carcinoma of the middle ear.

Basal-cell carcinoma of the external canal arises from the basal layer of the epidermis or from the sweat glands in the external canal. It forms large masses which protrude from the external canal and are firm, even hard, in consistency. The chief symptoms are pain and diminution of hearing. There is usually no excessive bleeding. The tumors grow slowly for years toward the opening of the external canal. They usually do not invade the cartilage but may invade the bone of the external canal. They do not invade the tympanic membrane cavity for a long time, but they may cause an osteitis of the lateral wall of the epitympanum. They do not cause metastases. The treatment consists of surgical excision of the tumor and irradiation therapy. Recurrences may eventually appear and may eventually grow into the skull.

Basal-cell carcinoma of the middle ear probably arises from aberrant portions of the parotid gland at the floor of the middle ear. The epithelial lining of the tympanal mucosa and the few glands in the mucosa are of minor importance as far as these tumors are concerned. Basal-cell carcinoma of the middle ear is less frequent than basal-cell carcinoma of the external canal. These tumors may run a latent course as long as they are hidden in the hypotympanum. Finally, however, they may extend into the facial canal and cause a facial paralysis and/or break through the tympanic membrane and grow into the external canal. They do not extend into the cymba conchae, because they become necrotic before reaching the cymba. The tumors may also grow into the mastoid process or through the anterior wall of the middle ear and Glaserian fissure into the mandibular joint or other parts of the temporal bone. In the long run, they invariably are associated with an infection. They may, perhaps, cause metastases. The chief symptoms are pain, diminution of hearing, and, eventually, facial paralysis. The treatment consists of surgical excision, irradiation, and, eventually, radical neck excision. Cures lasting for several years have been reported.

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SHORTENING THE LONG NOSE

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SHORTENING the long nose has always been the *bête noire* of the rhinoplastic surgeon, as has been attested by the many methods suggested for preventing postoperative elongation, "dropped tip." The technique of the current operation as devised by Joseph [1] is of the simplest. The stumbling block of Joseph's procedure lies in its need for improvisation, for which there can be no predetermined design and which can come only as a result of a prolonged trial-and-error experience. Many rhinologists neither possess the clinical facilities nor can afford the hazards inherent in such trial-and-error training.

For years we have been casting about for a method that would eliminate the pitfalls inescapable in extemporary surgery. We felt that the need for improvisation in itself indicated a lack of something in principle, and with this in mind we made a critical study of the established practice and were forced to challenge the soundness of its concept. Perhaps we can best bring out the inherent faults of Joseph's method by describing his technique. The basis of his procedure is the removal of a triangle of cartilage from the nasal pyramid and then the tilting of the lower segment into the space thus created (Fig. 1). This concept seems so logical that basically it has remained unchallenged for over 50 years.

Joseph [1] graphically describes his procedure as follows.

Intranasal shortening of the nose comprises two operative steps—first, shortening of the septum; and secondly, shortening of the lateral walls.

First Method, First Step: Intranasal Shortening of Septum. Just as in the case of a hump removal, I separate the skin over the dorsum intranasally and subcutaneously, as well as the skin over the lateral walls of the nose. Then I outline the septum with a hook-shaped incision (Fig. 2). Thereupon with a strong straight scissors I excise the lowermost part of the septal cartilage in the form of a triangle or wedge (Fig. 3). *Second Step: Intranasal Shortening of Lateral Walls.* With an angulated scissors the lower segment of the triangular [upper lateral] cartilage, together with the mucosa which covers it is excised (Fig. 1*B*). Following this the horizontal wound margin of the membranous septum is sutured to the quadrangular [septal] cartilage with a strong suture passing through the cartilage and membrane, in a manner similar to that used for the advancement of the nasal tip (Fig. 4).

Second Method. If the nose is unusually long, it may be possible to resect the quadrangular cartilage as far as the planned length of the nose and then remove from the apical [lower lateral] cartilage all the cartilaginous tissue which lies underneath this resection incision (Fig. 5).

1. Joseph, J.: Nasenplastik und sonstige Gesichtsplastik, Leipzig, Curt Kabitzsch, 1931.

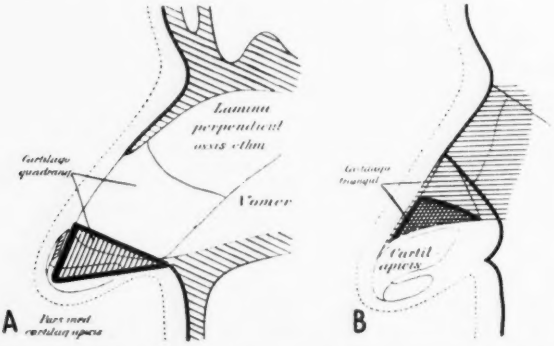

Fig. 1.—Removal of triangular section of cartilage, to create room for elevation of tip, according to Joseph's first method. *A*, shaded triangle shows location of wedge to be excised from septum, its size determining amount of shortening. *B*, light shading shows extent of skin separation; dark shading indicates excision from upper lateral cartilage. Reproduced from Joseph.[1]

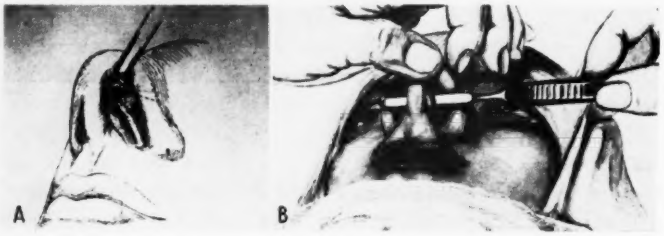

Fig. 2.—Transfixion of membranous septum, according to Joseph's first method. *A*, course of vestibular incision; *B*, membranous septum cut through with button-end knife. Reproduced from Joseph.[1]

Fig. 3.—Wedge resection from septal cartilage to shorten nose, according to Joseph's first method. Reproduced from Joseph.[1]

Joseph believed that the cicatricial adhesions formed at the juxtaposition of the upper and lower segments of the nasal pyramid maintained the elevation of the tip (Fig. 1). He attributed postoperative dropping to the weight of the lobule and the relatively greater contraction of the divided tissues at the septolabial angle. He tried to compensate for this by overcorrecting the shortening at the time of operation by passing two oblique sutures through the septal cartilage and columella "in a manner similar to that used for the advancement of the nasal tip" (Fig. 4).

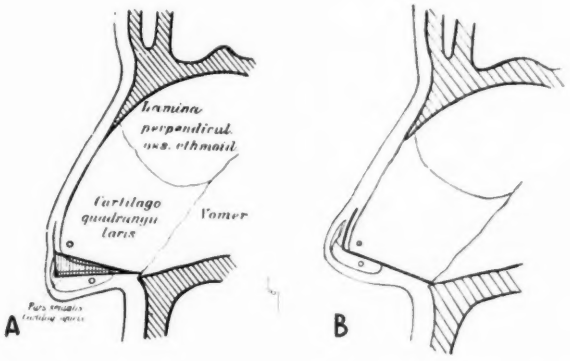

Fig. 4.—Overcorrection to compensate for postoperative dropping of tip, according to Joseph's first method. *A*, circles indicate obliquity (clocking) of sutures passed between columella and septal cartilage. *B*, circles indicate advancement and elevation of tip following tying of sutures. Reproduced from Joseph.[1]

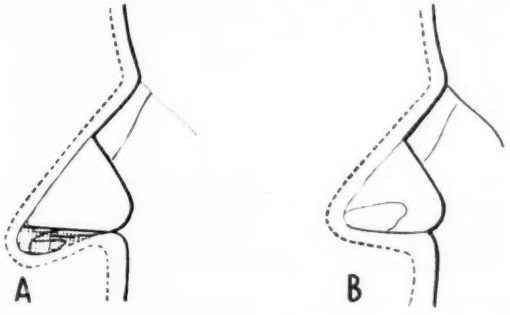

Fig. 5.—Second method of Joseph. *A*, resection of triangle from lower lateral cartilage, to create room for elevation of tip; *B*, result following approximation of columella to septal cartilage. Reproduced from Joseph.[1]

Objections to Joseph's Concept.—1. The septum is not always responsible for the length of the nose. Moreover, because of the extensibility of the membranous septum (Fig. 6) it is impossible to obtain a precise shortening by the removal of a predetermined triangle or wedge. We attempted to limit the stretch of the membrane by excising the mucoperichondrium from either side of the caudal end of the septum and sliding the membranous septum up over the bared cartilage. This procedure was

only partially successful.[2] We also tried excising the membrane. While this prevented postoperative dropping, it resulted in a retracted columella and a convexity of the lobule (Fig. 7*A*). After employing most of the suggested techniques we came to the conclusion that the only way to prevent postoperative dropping of the tip was to eliminate all stress or tension on the membranous septum.

2. A moment's reflection will show that the removal of triangular sections from the upper lateral cartilages, as suggested by Joseph, has no bearing on the actual shortening of the nose. When the tip is elevated, the cartilages slide through the

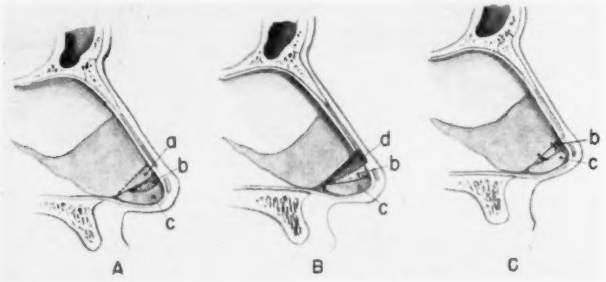

Fig. 6.—Extensibility of membranous septum precludes possibility of precise shortening by removal of predetermined triangle. *A*, sagittal section: *a*, septal cartilage; *b*, membranous septum; *c*, mesial crus. Dotted line indicates incision for removal of wedge. *B*, wedge removed. *C*, membranous septum attached to cartilaginous septum.

Fig. 7.—Faulty rhinoplasty. *A*, retracted columella and convexity of lobule resulting from removal of membranous septum; *B*, "pinched" appearance, due to apposition of upper and lower pyramids of unequal size.

intercartilaginous incisions into the nasal cavity. Although it is true that these cartilages will need some reconstruction, it will not be for shortening but rather for functional purposes.

Defects of Joseph's Method.—1. The elevation of the tip at the time of operation gives no assurance against postoperative "dropping," because the exact amount of subsequent contraction and the extensibility of the membranous septum (Fig. 6)

2. Fomon, S.; Goldman, I. B.; Neivert, H., and Schattner, A.: Management of Deformities of Lower Cartilaginous Vault, A. M. A. Arch. Otolaryng. **54**:467 (Nov.) 1951.

are impossible to predict with any fair degree of accuracy. A drop of even a few millimeters will materially detract from the success of the operation. As a result, further shortening is required in about 10% of all rhinoplasties.

2. The method will cause a retraction of the columella, with an accompanying "snubbing" or convexity of the tip when the length is due to a downward displacement of the lower lateral cartilages or to an excessive length of the bony or lower cartilaginous segment (Fig. 8).

3. A "pinched" appearance sometimes results from bringing into apposition an upper and a lower pyramid of unequal sizes (Fig. 7*B*). The correction of this deformity requires considerable improvisation. Huffman [3] suggested that the upper lateral cartilages be deepithelized and inserted in a pocket between the vestibular skin and the lateral crus.

4. Occasionally there results an impairment of function due to the necessary separation of the upper lateral cartilages from the septum.

5. Finally, by this method a natural inclination of the columella is difficult to

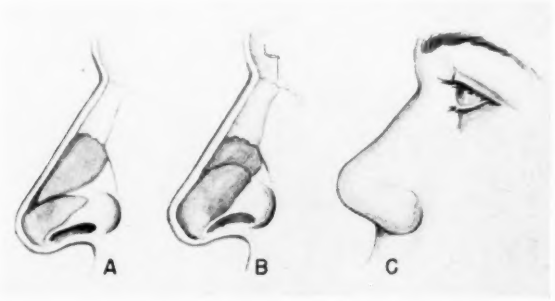

Fig. 8.—Effect of rhinoplasty upon nasal components. *A*, excessive length caused by septum and upper lateral cartilages; for this type, best results will be obtained with Joseph's technique; *B*, excessive length caused by long nasal bones and/or lower lateral cartilages; for this type the result shown in *C* will be obtained with Joseph's technique; *C*, retracted columella with "snubbed" tip.

obtain, because the preliminary excision prevents shaping of the caudal end of the septum.

SUGGESTED METHOD

By chance rather than by intelligent forethought, we hit upon a more rational method, which does away with most of the perils besetting the beginner. We employed the procedure based on our present rationale at first tentatively, then with conviction, and finally with enthusiasm. We now have given it sufficient trial to justify its recommendation.

The basis of our technique is shortening by rotation of the lower over the upper cartilaginous vault, in a manner similar to that of raising the visor on a fourteenth century helmet. A general idea of the procedure can be obtained by grasping the columella between thumb and forefinger and rotating the lower cartilaginous segment over the upper (Fig. 9).

3. Huffman, W.: Personal communication to the authors.

Advantages.—1. This method permits a more precise trimming of the cartilage, since the amount removed is determined after the shortening and the excess resected as an overlap, whereas in Joseph's technique the cartilage is removed prior to the shortening, and, as mentioned before, the extensibility of the membranous septum precludes a precise estimation of the amount of septal cartilage to be removed. For example, in Joseph's method a predetermined piece of cartilage is removed in a manner similar to a dressmaker's maneuver in preparing the shoulder of a garment

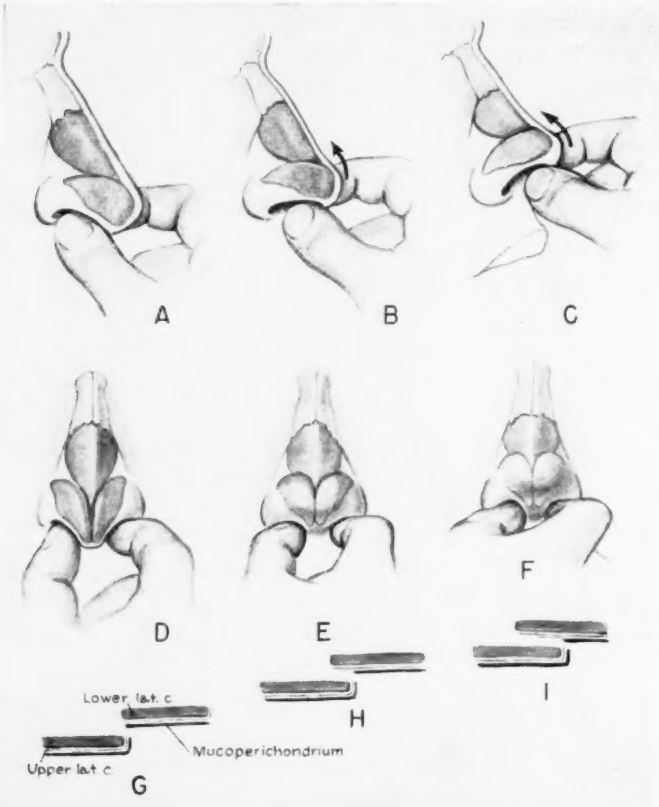

Fig. 9.—Shortening of nose by superimposition of lower cartilaginous vault over upper. *A*, columella grasped between thumb and forefinger; *B*, and *C*, lower cartilaginous vault rotated over upper; *D*, *E*, and *F*, serial frontal views; *G*, *H*, and *I*, sagittal sections, showing relation of aponeurosis between upper and lower lateral cartilages.

for the placing of a sleeve, whereas we would determine the amount of cloth to be removed by first attaching the sleeve to the bodice and then cutting away the overlap. We feel that only by superimposing the cartilages can one estimate the exact amount to be removed.

2. The shortening by rotation eliminates all tension on the membranous septum, does away with the need of traction sutures, and thus guards against postoperative elongation, whereas in Joseph's method the membrane is always on stretch and

traction sutures are depended upon to maintain the elevation. The wide overlap between the raw surfaces of the upper and lower cartilaginous vaults assures strong adhesions and eliminates postoperative dropping in such a way that no overcorrection is necessary. In Joseph's procedure, the narrow marginal scar at the juxtaposition of the divided pyramid cannot resist the weight of the lobule, dropping takes place, and, to prevent this, overcorrection is imperative.

3. Since most of the cartilage is preserved, the possibility of a pinched "surgical" appearance (Fig. 7*B*) is obviated.

4. The varying lengths of the individual components have no effect on the success of the method (Fig. 8).

5. It is often possible to preserve the relationship between the septum and the upper lateral cartilages, thus minimizing interference with function.

Technique.—Shortening the nose and modeling the tip must be done simultaneously, and this is accomplished by the usual procedures, performed with a new concept in mind. The following sequence is employed: (1) uncovering of osseous and upper cartilaginous vault, (2) uncovering of lower cartilaginous vault, (3) creation of septolabial angle, (4) suture of mesial crura, (5) shortening of nose by superimposition of cartilages, (6) reconstruction of columellar inclination, (7) modeling of upper cartilaginous vault, (8) shaping of contour, (9) elevation of terminal ends of lateral crura, and (10) application of dressing.

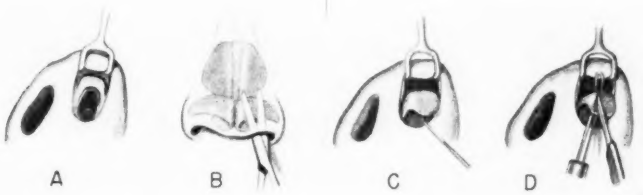

Fig. 10.—Exposure of lower lateral cartilages. *A*, marginal incision made along caudal border; *B*, overlying soft structures elevated; *C*, cartilage delivered; *D*, angle cut through.

Details of these steps are as follows.

1. The soft tissues overlying the nasal skeleton are elevated, and the columella is transfixed in the usual manner.[4]

2. A circumferential incision is made along the caudal margin of the lower lateral cartilages, through which the overlying skin of the lobule is elevated. The lower lateral cartilages are delivered and the angles cut through (Fig. 10).

3. The septolabial angle is reconstructed, with two objectives in view.

A. It is made to lie 1 to 2 mm. below the lower margin of the alar rim (Fig. 11*A*). If the angle is too prominent (Fig. 11*B*), the caudodorsal portion of the septum and/or the nasal spine is reduced. If the angle is retracted (Fig. 11*C*), it is projected at the expense of the width as follows. A raw surface is created by the removal of subcutaneous tissue at the base of the columella, and a mattress suture is passed and tied to bring about the desired angle (Fig. 12*A*). If the retraction is associated with a wide alar base or a short columella, the alae are cut through where they abut the lip (Fig. 12*B*), and through these incisions the base of the nose is

4. Fomon, S.; Silver, A. G.; Gilbert, J. G., and Syracuse, V. R.: Physiologic Surgery of Nares, Arch. Otolaryng. **47**:608 (May) 1948. Fomon, S.: Surgery of Injury and Plastic Repair, Baltimore, William Wood & Company, 1939.

Fig. 11.—Photographs showing *A*, normal septolabial angle 1 to 2 mm. below lower margin of alar rim and length of columella 1 to 2 mm. longer than vertical length of lip; *B*, projecting septolabial angle; *C*, retracted septolabial angle.

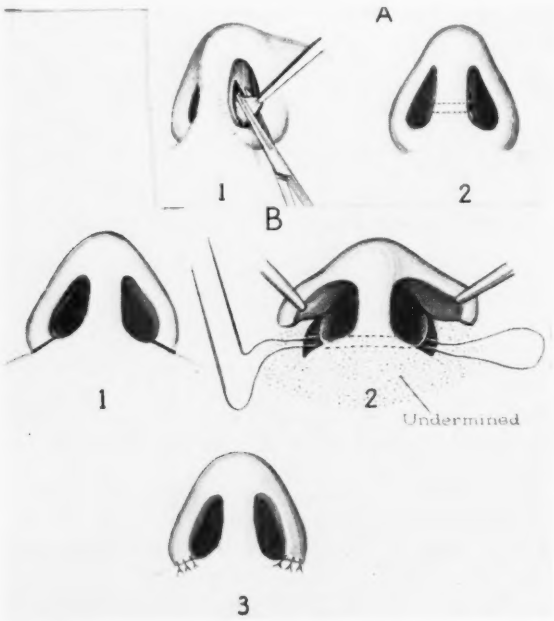

Fig. 12.—Reconstruction of septolabial angle. *A*, retracted angle brought forward: (1) raw surface created by excision of subcutaneous tissue; (2) walls approximated, to secure desired projection. *B*, retracted angle with wide alar base: (1) alae separated from lip; (2) base of nose separated from underlying bone; dotted area indicates amount of undermining; absorbable surgical suture passed through tissues and then tied; (3) alar incisions closed.

separated from its attachment to the bone. An absorbable surgical suture threaded through two straight needles is then passed through the tissues, entered through one incision, and brought out through the other. The suture is tightened to secure the desired angle and tied. The two alar incisions are then closed with two or three atraumatic sutures.

B. The angle is now placed forward or backward so that the length of the columella will be 1 or 2 mm. longer than the vertical length of the lip (Fig. 11*A*). Any disproportion between the two is corrected as follows: If the columella is too short, it is lengthened at the expense of the lip; if it is too long, it is shortened by sliding the excess columellar tissue into the lip. This is accomplished by a perforating suture[5] (Fig. 13). One needle of a double-armed suture enters the skin of the columella and is pushed through to emerge from one of the columellar

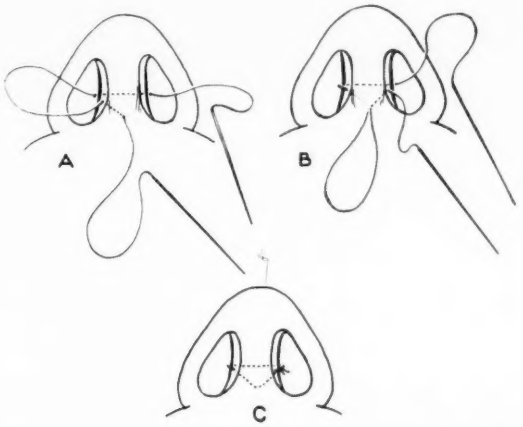

Fig. 13.—Suture for lengthening or shortening columella.

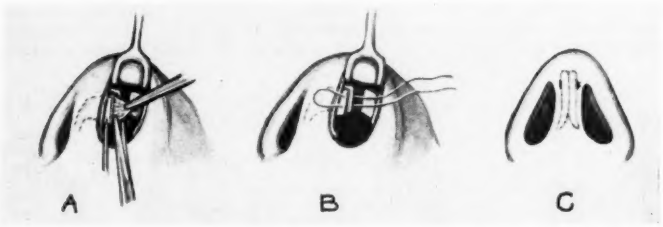

Fig. 14.—Modeling of mesial crura. *A*, both mesial crura exposed, and intervening soft tissue removed; *B*, crura approximated with mattress suture, and free ends equalized; *C*, suture tied.

walls. It is then carried through the dorsocaudal (posteroinferior) part of the septum and brought out through the naris. The other needle is carried through the original point of entry, brought out through the other columellar wall, and the ends are tied. When the desired nasolabial angle is obtained, it is fixed to the septum with a catgut suture.

4. The cut ends of the mesial crura are delivered. If cleft or unequal, the intervening subcutaneous tissue is excised, the crura are equalized, and the cartilages are brought together with a catgut suture (Fig. 14).

5. Daley, J.: Retaining a Correct Septolabial Angle in Rhinoplasty, Arch. Otolaryng. **39**: 348 (April) 1944; The Rôle of Columellar and Septo-Columellar Sutures in Rhinoplasty, Arch. Otolaryng. **45**:178 (Feb.) 1947.

5. With the above-mentioned angle as a pivotal point, the columella is grasped between thumb and forefinger, and with an upward (cephalad) and backward (dorsad) motion the lower cartilaginous vault is made to slide over the upper (Fig. 9) until the desired length is obtained. From a surgical standpoint, length is determined not by the distance from the nasion to the tip but by the angle that the slope of the nares forms with the lip. In men the desired

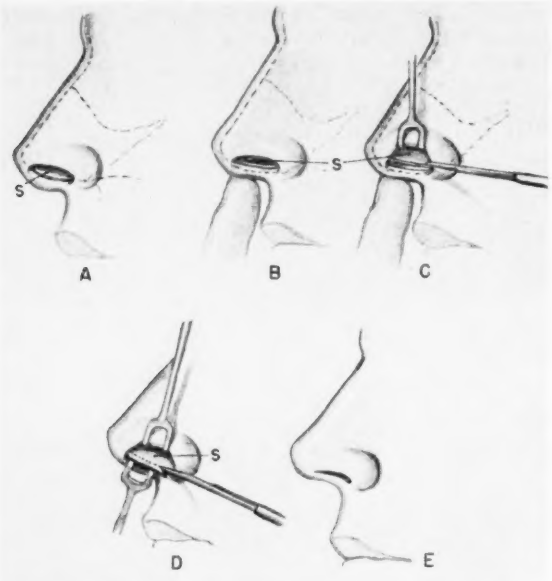

Fig. 15.—Method of ascertaining projection and inclination of columella after rotation of cartilages. *A*, hanging columella, due to projecting septum; *B*, columella raised along side of septum, to obtain normal projection and inclination; *C*, ala retracted and amount of cartilage to be excised marked out with knife; *D*, cartilage excised; *E*, result following excision.

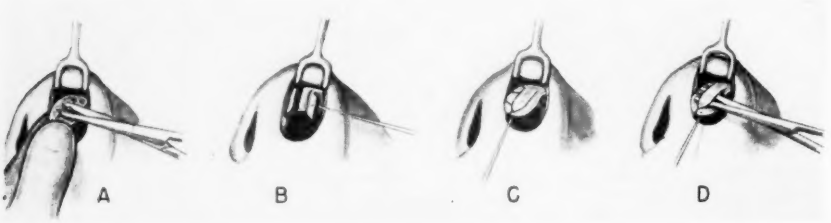

Fig. 16.—Modeling of lateral crura. *A*, soft tissue over cartilage removed; *B*, flap of vestibular skin raised; *C*, cross-cuts made through cartilage, to break spring; *D*, section of cartilage peeled off when deformity results from faults in shape and excess bulk.

length is obtained when the slope of the nares forms an angle with the lip of 90 to 95 degrees and in women when it forms an angle of 100 to 110 degrees (Fig. 11*A*).

With the aponeurosis between the upper and lower laterals cut, this position is automatically maintained, probably by the contraction of the overlying skin. It is often necessary to repeat the rotation several times before the parts stay in place. The reason for this we do not know. We assume that in the rotation some of the remaining attached fibers are separated or that the manipulation favors the skin contraction.

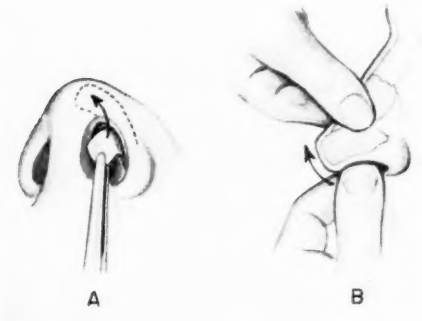

Fig. 17.—Modeling of lateral crura (continued). *A*, free end of lateral crus grasped with forceps and dislocated downward into tip, to create break above lobule; *B*, with the fingers of the left hand above the lobule and those of the right hand grasping the columella, the ends of the lateral crura are forced over the mesial crura

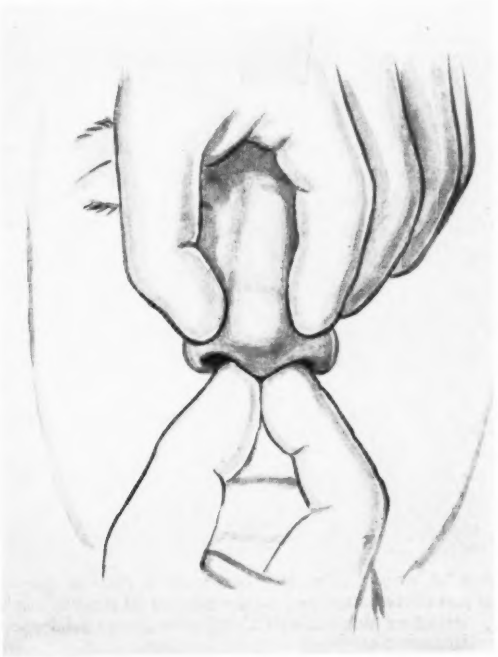

Fig. 18.—Adjustment of soft tissues. Covering flap of skin and subcutaneous tissue and lining flap of vestibular skin and cartilage manipulated into desired relationship.

6. The columella is placed against the septum. If it does not project more than 1 to 2 mm. below the alar rim (Fig. 11*A*), the septal cartilage is left intact. If, however, it projects to a greater degree, the columella is made to overlap the septum and is raised until it assumes a proper projection. At this level, its position is marked out on the septum with a knife. The

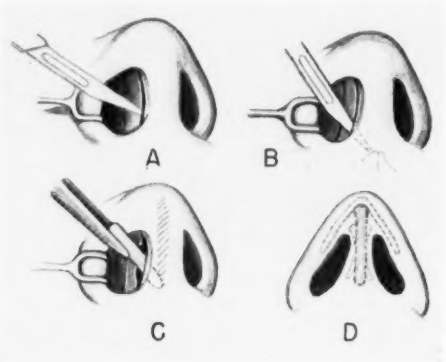

Fig. 19.—Raising of terminal ends of lateral crura by batten. *A*, incision along mesial crus extended; *B*, pocket made between skin and caudal margin of mesial crura; *C*, batten introduced; *D*, relationship of batten to lateral cura.

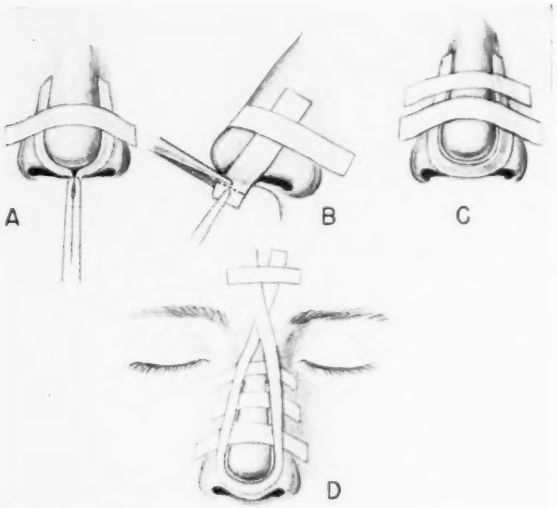

Fig. 20.—Dressing. *A*, strip of adhesive plaster made to encircle base of lobule, another strip applied over dorsum just above batten, and plaster pinched up beneath lobule, to force batten into proper position; *B*, pinched-up tuck excised; *C*, adhesive plaster reinforced by additional strips; *D*, sling support.

columella is now released and the septal cartilage sliced down and shaped until the columella assumes the desired projection and inclination (Fig. 15).

The columella is now approximated to the septum with one or more atraumatic sutures or with a 5-0 catgut suture, no attempt being made at overcorrection and care being taken to avoid

traction on the membrane. (With Joseph's technique the shortening depends on the stretch of the membranous septum; in this procedure, owing to the rotation of the cartilages, the membranous septum is relaxed.)

7. The upper cartilaginous vault at this stage is wide, thick, and deformed, because of the overlap of cartilage, and requires modeling. With a dural hook the overlapping lateral crura are drawn downward and brought into view. The overlying soft tissue is dissected away. If the cartilage is misshapen or excessive in bulk, it is shaved and crosshatched until the spring has been entirely destroyed (Fig. 16), after which the terminal ends of the lateral crura are caught with a forceps and deliberately dislocated downward, to create a "break" above the lobule (Fig. 17). The thumb and forefinger of the left hand are placed over the terminal ends of the lateral crura, and with the fingers of the right hand the lateral crura are forced upward and backward to lie over the mesial crura.

The upper lateral cartilages are now treated as follows. If unduly long, the excess is submucously resected. If too thick, they are shaved down. If abnormally shaped, they are remodeled by crosshatching, to destroy the spring.

8. With all the parts mobilized (cover, support, and lining), the parts are shifted with the fingers, as one would shape a piece of clay, until the desired contour has been attained (Fig. 18).

9. The terminal ends of the lateral crura, which at this stage are "bunched" over the tip, are raised and the soft tissues of the lobule draped by the introduction of a batten,[6] as shown in Figure 19.

10. The nostrils are lightly packed with petrolatum gauze, to hold the flaps in place. The shape of the nose is maintained with adhesive strips, which act as a mold in which the mobilized tissues heal, similarly to the congealing of jelly poured into a container.[2] The length of the nose is controlled by a sling extending from the lobule to a point on the forehead (Fig. 20). The adhesive is covered with a Stent dressing held in place with additional strips of adhesive. The dressing is not disturbed until healing has taken place, i. e. for a week to 10 days.

SUMMARY

A procedure for shortening the nose by superimposition of the cartilaginous elements is described. Since the nose is first shortened and the excess septal cartilage resected as an overlap, this procedure permits of a more precise trimming. All tension on the membranous septum is done away with, and traction sutures are unnecessary. Since most of the cartilage is preserved, the possibility of a "pinched" appearance is obviated.

6. Silver, A. G.: Pitfalls in Rhinoplasty, Eye, Ear, Nose & Throat Month. **31**:556 (Oct.) 1952. Becker, O. J.: Aids in Rhinoplastic Procedures, Ann. Otol. Rhin. & Laryng. **55**:562 (Sept.) 1946.

NOTES ON THE INNERVATION OF THE COCHLEA. II

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IN A PRECEDING article,[1] the existence of two systems of fibers, independent of each other, in the lamina spiralis of the cochlea of mammals was clearly demonstrated. Of these two systems, one is radially arranged and has its origin in the cells of the spiral ganglion, while the other is spirally arranged and is independent of the spiral ganglion. The origin and destination of the spiral fibers appear to be uncertain [2]; however, I am of the opinion that some, if not all of them, represent the peripheral fibers of the vestibular cells contained in a modiolar expansion of the vestibular ganglion, formerly described by Boettcher [3] as an independent ganglion and clearly recognizable in my preparations. The vestibulocochlear anastomosis described by Oort partially consists of these fibers from the modiolar ganglion joining the cochlear nerve.

The spiral fibers, or at least part of them, should then be considered vestibular fibers taking part (exactly how is still unknown) in the sensory innervation of the cochlea.

On the other hand, Rasmussen,[4] studying by means of serial sections the degenerative reactions to experimentally produced lesions of the superior olivary complex of cats, was able to demonstrate that olivary fibers run in the inferior division of the vestibular nerve as far as its ganglion, which is associated with the main saccular ramus, and then, accompanying the blood vessels, continue into Oort's anastomosis as far as the first half of the basal coil of the cochlea.

After making these observations, Rasmussen is of the opinion that the vestibulocochlear anastomosis consists partially of efferent fibers from the superior olivary nucleus, providing the autonomic innervation of the cachlea. Rasmussen has stated:

"If these be preganglionic neurons, one would expect the existence of postganglionic neurons. So far, no definite evidence has been found of the presence of cells in the cochlea answering the description of the postganglionic type."

From the Institute of Anatomy (Director, Prof. A. C. Bruni) and the Ear, Nose, and Throat Clinic (Director, Prof. L. Pietrantoni) of the University of Milan.

1. Bocca, E.: Notes on the Innervation of the Cochlea, A. M. A. Arch. Otolaryng. **55**:188, 1952.

2. del Bo, M., and Livan, M.: De l'existence d'un plexe nerveus marginal et paramarginal au niveau de la lame spirale, Acta anat. **13**:16, 1951. Palumbi, G.: Nuovi apparati espansionali nervosi recettori nel labirinto membranoso dell'orecchio umano, Boll. Soc. med.-chir., Pavia **5**:1, 1950.

3. Boettcher, A.: Über Entwickelung und Bau des Gehörlabyrinths, Verhandl. K. Leop. Carol. deutsch. Akad. Naturförscher, 1869.

4. Rasmussen, G. L.: The Olivary Peduncle and Other Fiber Projections of the Superior Olivary Complex, J. Comp. Neurol. **84**:141, 1946.

He believes that postganglionic cells may exist somewhere, although few and widely scattered. Owing to technical difficulties, the olivary fibers could not be followed into the spiral ganglion.

Rather recently Portmann [5a] further demonstrated the absolute independence of the two systems, spiral and radial, of cochlear fibers, supporting his views with brilliant experimental research. He believes that the spiral system of fibers is a continuation of the olivary fibers which Rasmussen had not been able to follow beyond the first half of the basal coil. The spiral fibers can then be regarded as autonomic fibers of olivary origin, playing an ill-defined role in the interauricular synergism and spatial representation of sounds. This opinion is shared by Fernandez.[5b]

As a matter of fact, the continuity of the olivary fibers of Rasmussen with the spiral bundles in the lamina spiralis is purely presumptive and lacks any definite anatomical evidence; therefore, the interpretation of the anatomic and functional significance of these bundles remains open for discussion.

With the hope of adding new facts to this interpretation, I undertook a new set of investigations; my research included the study of the embryos of mammals and birds.

The purpose of my investigation was threefold: (1) to demonstrate in the inner ear the existence of cells, isolated or in groups, fitting the description of the vegetative type, thus adding evidence to the research of Rasmussen by confirming the existence of autonomic postganglionic neurons, (2) to demonstrate further the validity of my previous statements regarding the vestibular innervation of the cochlea, and (3) to interpret physiologically the observed facts.

The first point has been discussed in a recent article by Bruni and myself.[6] The careful study of serial sections of the inner ear of rat and chicken embryos led to the discovery of rudiments of vegetative ganglions adjacent to the vestibular ganglion; their peripheral fibers join the sensory fibers as they travel toward the cochlea. The presence of postganglionic autonomic neurons, anticipated though not demonstrated by Rasmussen, has been therefore confirmed.

The second point was carried out through the study of slides from the private collection of Bruni. Figures 1 *A* and *B* and 2 *A* and *B* represent, at different magnifications, a section of the cochlea of a rat embryo at approximately the same level as that demonstrated in Figure 3 *A* and *B* of my preceding article.[1] Single peripheral fibers coming from the modiolar expansion of the vestibular ganglion can be clearly observed running toward the main cochlear bundles (Fig. 3 *A* [1]) and mingling intimately with the cochlear fibers after running a brief course. I was convinced through my observations that the bundles marked *b* in Figures 1 *B* and 2 *A* and *B* consist of fibers of vestibular origin. Sections cut on different planes lying rostral to the preceding ones lend additional support to my observations (Fig. 3 *A* and *B*). They very clearly reveal that a conspicuous amount of vestibular fibers originating in the modiolar expansion of the vestibular ganglion enter the cochlear nerve.

5. (*a*) Portmann, M.: Les fibres nerveuses efférentes cochléaires, Bordeaux, Les editions, 1952. (*b*) Fernandez C.: The Innervation of the Cochlea (Guinea Pig), Laryngoscope **61**:1152, 1951.

6. Bruni, A. C., and Bocca, E.: Monitore Zoologico, to be published.

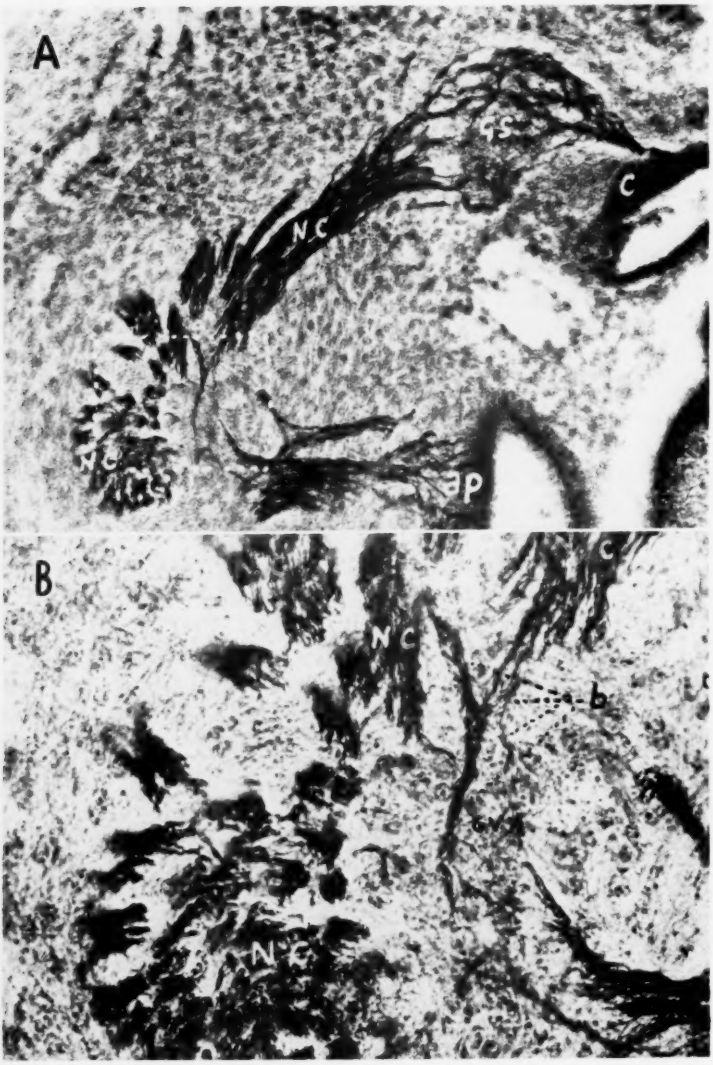

Fig. 1.—*A*, horizontal section through base of modiolus of a rat embryo (Cajal stain); *NC*, nervus cochlearis; *ap*, ampulla of the posterior canal; *C*, cochlear canal; *GS*, ganglion spirale (× 140).

B, higher magnification of dotted area in Figure 1*A*; *NC*, nervus cochlearis; *GVA*, modiolar expansion of the vestibular ganglion (Boettcher's ganglion); practically all of the bundles marked *b* consist of vestibular fibers (× 500).

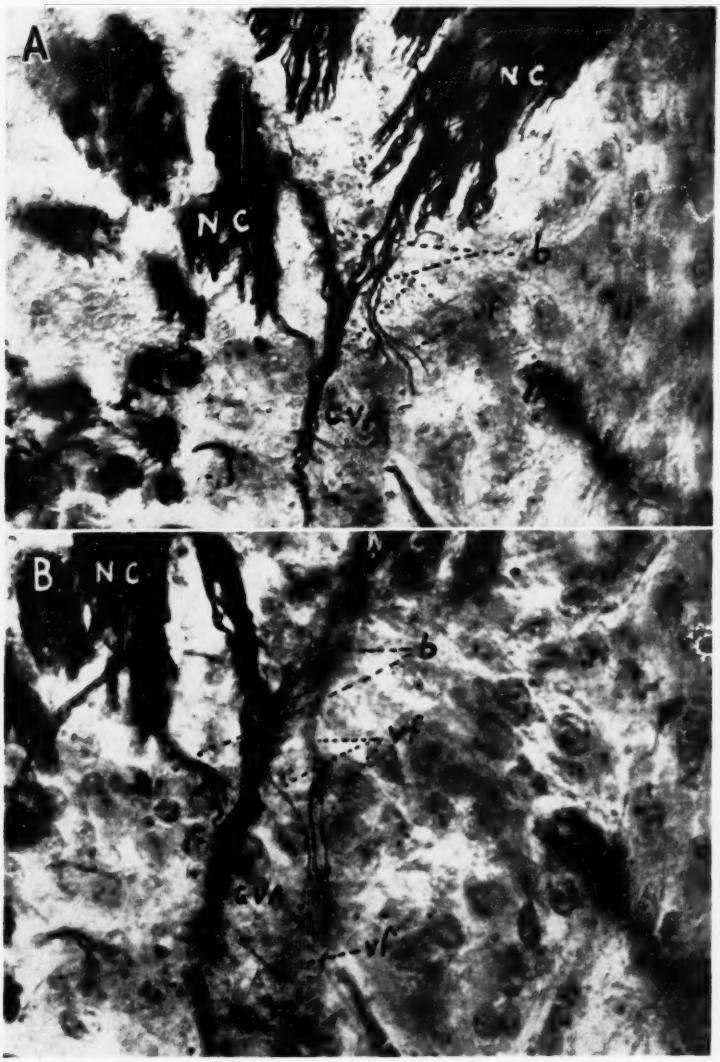

Fig. 2.—*A*, higher magnification of dotted area in Figure 1*A*; *NC*, nervus cochlearis; *GVA*, modiolar expansion of vestibular ganglion; *vf*, vestibular fibers proceeding from the vestibular ganglion and joining the cochlear fibers; practically all the bundles marked *b* consist of vestibular fibers (× 570).

B, the same as Figure 2*A* but at a higher magnification (× 870).

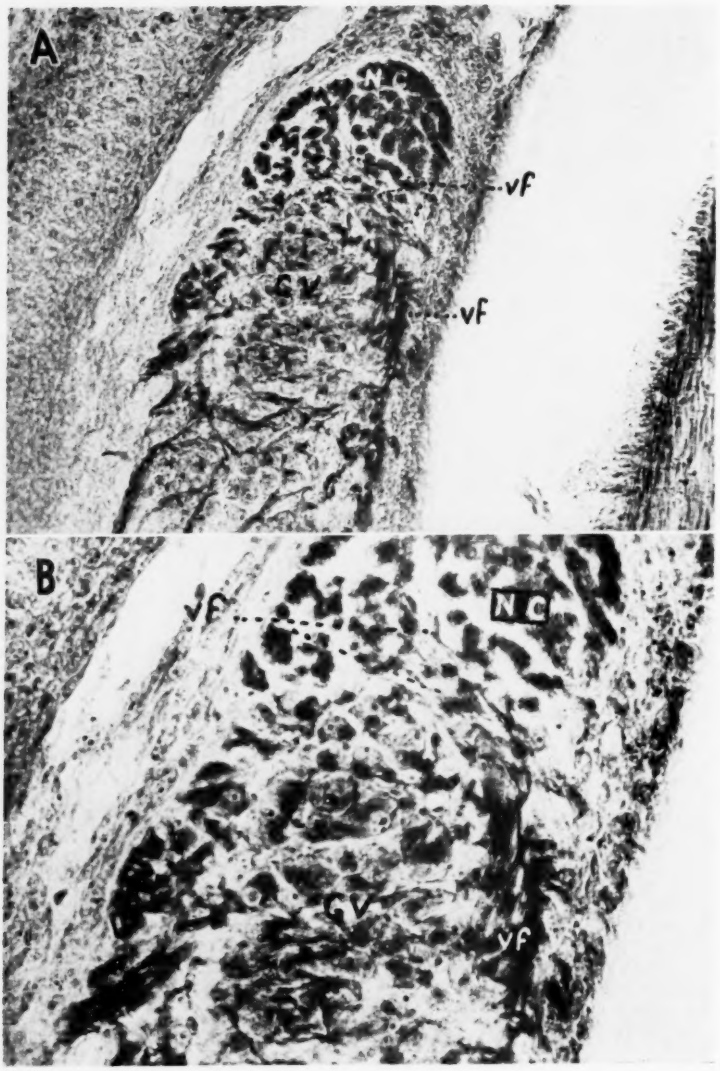

Fig. 3.—*A*, horizontal section of a rat embryo, rostral to the preceding ones; *NC*, nervus cochlearis; *GV*, ganglion vestibulare; the vestibular fibers can be clearly observed as they enter the cochlear nerve (*vf*) (× 300).

B, the same as Figure 3*A* but at a higher magnification (× 590).

obliquely cross the fibers as though dissociating them, and ultimately follow a vertical course like all other cochlear fibers with which they become associated, making it impossible to recognize them thereafter.

Assuming that the vestibular fibers of the cochlea are a system in regression, I decided that additional information regarding these fibers could be obtained by studying the inner ear of animals in which the cochlear canal with its nerves and ganglion, although well differentiated, is not yet sharply seperated from the vestibular formations.

It is well known from the research of Wiedersheim,[7] Kappers,[8] and Federici[9] that in the course of phylogenesis the labyrinth is a purely static organ in the beginning; only in Plagiostomes, with the development of the lagena, does it probably acquire a primitive sensibility to vibratory stimuli. In the progression from aquatic to terrestrial life a new formation develops in the labyrinth, the papilla basilaris, which is considered the equivalent of the cochlear portion of the more highly developed vertebrates. This formation has its own sensorial area, and the fibers proceeding from it run into the posterior ramus of the vestibular nerve. The papilla basilaris develops between the lagena and the sacculus, to which it remains united by a narrow canal (the equivalent of the ductus reuniens). The papilla basilaris first reaches a remarkable size in birds, in which it is represented by a long, slightly bent canal. With the progressive lengthening and bending of the cochlear canal, the lagena is pushed more and more caudally and ventrally to the sacculus at the extremity of the blind end of the cochlear tube. In its progressive migration the lagena draws along the vestibular fibers providing its innervation. A new system of sensory fibers and cells is differentiated in birds, destined to innervate the papilla basilaris: the ganglion cochleare and nervus cochlearis. In the opinion of the majority of investigators, the ganglion cochleare and nervus cochlearis since the beginning are sharply divided and distinct from the ganglion and nervum vestibulare. According to Federici, whose study of the inner ear of birds has probably been the most accurate, the vestibular nerve supplies the lagena by means of a bundle running adjacent to the cochlear nerve after having wound around the saccular ramus; in his opinion this bundle is equivalent to the vestibulocochlear ramus of Oort.

The favorable arrangement of the cochlear and vestibular formations in the inner ear of birds persuaded me to choose this vertebrate in extending the research previously made on mammals.

Figure 4 *A* and *B* reveals the general arrangement of the ganglions and fibers of a chicken embryo of 8 days on a section cut parallel to the main axis of the embryo on a sagittal plane at a level corresponding to the lagena and the papilla basilaris.

The cochlear peripheral fibers, observed at a different, more recent stage of development, are much less deeply stained with silver stain than the vestibular fibers.

Two very important facts are noted. First, a contingent of fibers stained more deeply than the cochlear fibers but less than those of vestibular origin joins the

7. Wiedersheim, R.: Grundriss der vergleichende Anatomie der Wirbelthiere für Studierende bearbeitet, Ed. 7, Jena, Gustav Fischer, 1909, p. 422.

8. Kappers, C. U. A.: Die vergleichende Anatomie des Nervensystems der Wirbeltiere und des Menschen, Haarlem, de Erven F. Bohn, 1920, p. 404.

9. Federici, F.: Über die peripherische Ausbreitung des VIII Schädelnervenpaares bei den Vögeln und über die Bedeutung der Lagena, Anat. Anz. **61**:449, 1926.

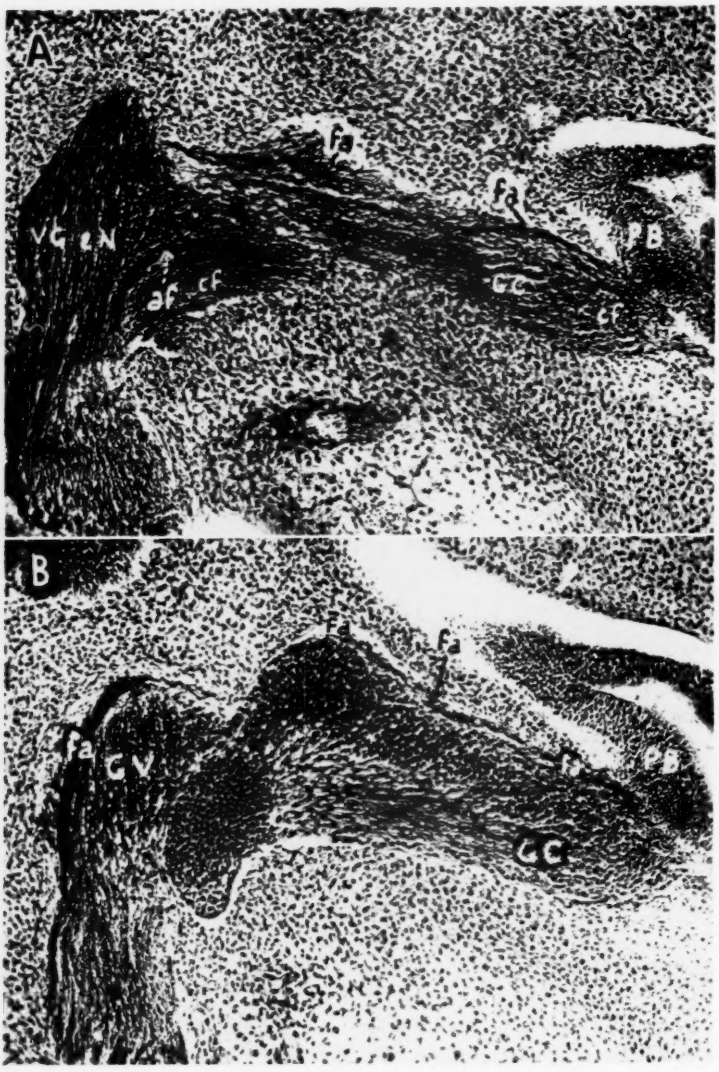

Fig. 4.—*A*, sagittal section of an 8 mm.-chicken embryo (Cajal stain); a general view of the arrangement of fibers innervating the papilla basilaris (*PB*); *VG*, vestibular ganglion; *N*, vestibular nerve; *af*, autonomic fibers, darker than cochlear fibers (*cf*) but lighter than vestibular fibers, running along the cochlear nerve; site of origin of the autonomic fibers is an autonomic ganglion roughly situated in the dotted area; *GC*, ganglion cochleare; *fa*, vestibular bundle, darkly stained, running to the papilla basilaris and the lagena (× 140).

B, the course of the vestibular bundle is clearly visible (× 150).

cochlear nerve originating from a ganglion-like formation (lying approximately in the dotted circle [Fig. 4 *A*]) formed by cells possessing the characteristics of the autonomic type. Further evidence of this may be found in the article written by Bruni and me.[6] Secondly, an important bundle of deeply stained fibers joins the cochlear fibers in the innervation of the papilla basilaris. The general course of this bundle is clearly shown in Figure 4 *B*. It appears to be identical to the ramus running to the lagena described by Federici. Its origin is clearly visible at a higher magnification in Figures 5 *A* and *B* and 6*A*; its termination can be observed in Figure 6 *B*. It may be concluded that in birds the vestibular fibers originating from the main vestibular ganglion (in this respect their origin corresponds to the origin of fibers running to the sacculus) and from an expansion of the ganglion itself, which might be considered the equivalent of Boettcher's ganglion in mammals, not only provide the nervous supply for the lagena but also take an important part in the innervation of the papilla basilaris. The sharp division between the sensory fibers running to the lagena (vestibular) and to the papilla basilaris (cochlear) is not confirmed here; on the contrary, the intimate connection between the two territories of innervation and the two types of fibers are very evident. An autonomic contingent of fibers also terminates in the cochlea. It is interesting to observe that at the level of the papilla basilaris (Fig. 6 *B*) the course of the vestibular fibers is roughly at a right angle to that of the cochlear fibers and that their way of dividing in plexus-like formations, intimately mingling with the peripheral cochlear fibers, strikingly resembles the aspect observed in the section of a rat embryo (Fig. 7 *A*), except for the fact that in the chicken the size and number of these vestibular fibers are substantially greater.

The clear demonstration of vestibular fibers innervating the cochlea of birds is of the greatest importance, as it aids in explaining the aspects revealed in mammals in the course of this and my previous investigations and fully justifies my hypothesis. The vestibular participation in the innervation of the cochlea seems to be unquestionable on the basis of the anatomical evidence.

That the vestibular fibers running to the cochlea should be mainly represented by the spiral system of fibers can be explained by two facts. First, a noncochlear system of fibers, rather similar to the general orientation and mutual relationship of the cochlear system with the spiral system of mammals, may be illustrated in birds. The different staining properties and a more favorable arrangement illustrating the origin and destination of these fibers leave no room for doubt; they are vestibular fibers and join the cochlear ones in the sensory innervation of the papilla basilaris. Secondly, the lagena and the initial portion of the cochlear epithelium, which are innervated solely or partially by vestibular fibers, tend to be more and more displaced, in the advanced stages of evolution, toward the apical end of the cochlea as a consequence of the development of the cochlear canal, drawing along with them their innervating fibers (Federici [9]).

On the other hand, the spiral fibers of the mammalian cochlea can not only be clearly observed until they reach the apical coil (Bocca [1]), contrary to that observed by other investigators (Portmann [5a] and Fernandez [5b]), but at this location they may be observed giving rise to a large number of ramifications (Figs. 7*A* and 8*A* [1]).

Inasmuch as the spiral fibers of mammals are considered remnants of the lagena-basilar vestibular fibers of birds, the arrangement described above is highly suggestive.

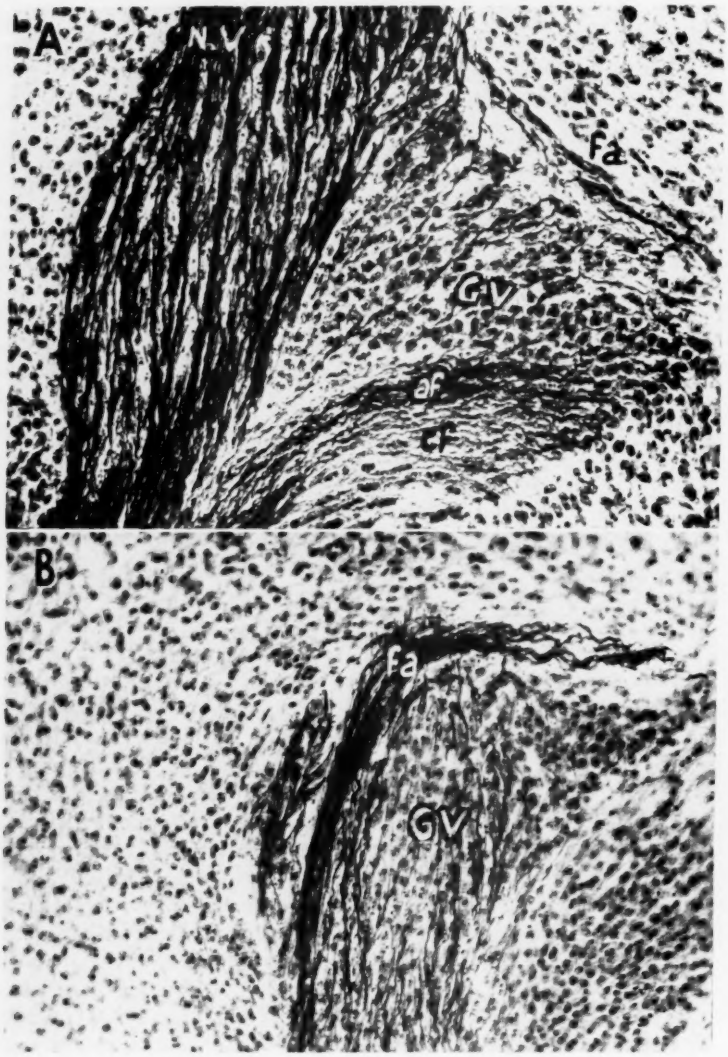

Fig. 5.—*A*, higher magnification of Figure 4*A* and *B*, showing fibers of the vestibular bundle (*fa*) originating from an expansion of the vestibular ganglion (*GV.A*) and from the principal ganglion (*GV*); *NV*, nervus vestibularis (× 380).

B, same as Figure 4*B* but at a different magnification (× 330).

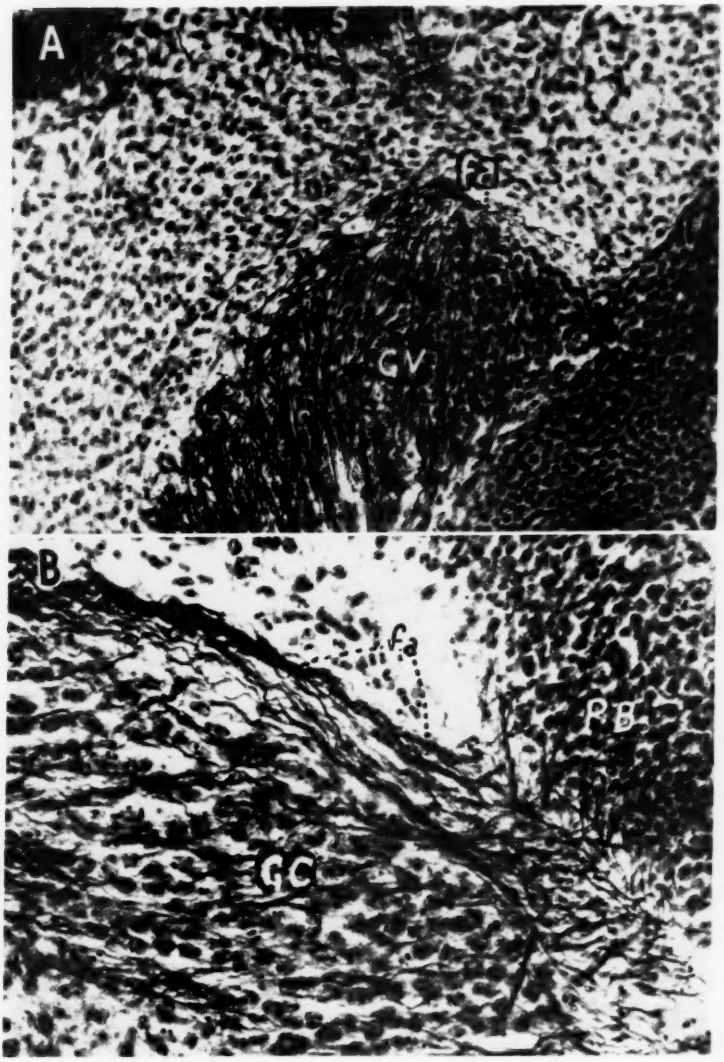

Fig. 6.—*A*, the same as Figure 5*B* but cut on a slightly different plane; *GV*, ganglion vestibulare; *fa*, vestibular bundle of the cochlea; *S*, saccular macula; some vestibular fibers can be clearly observed as they travel to the sacculus, while others can be observed bending to form the bundle running to the cochlea (*fa*) (× 330).

B, a higher magnification of Figure 4*A*; the mode of termination of the vestibular bundle (*fa*) in the sensory epithelium of the papilla basilaris (*PB*) is visible; spreading into a plexiform network, the vestibular fibers mingle intimately with the cochlear fibers; *GC*, ganglion cochleare (× 550).

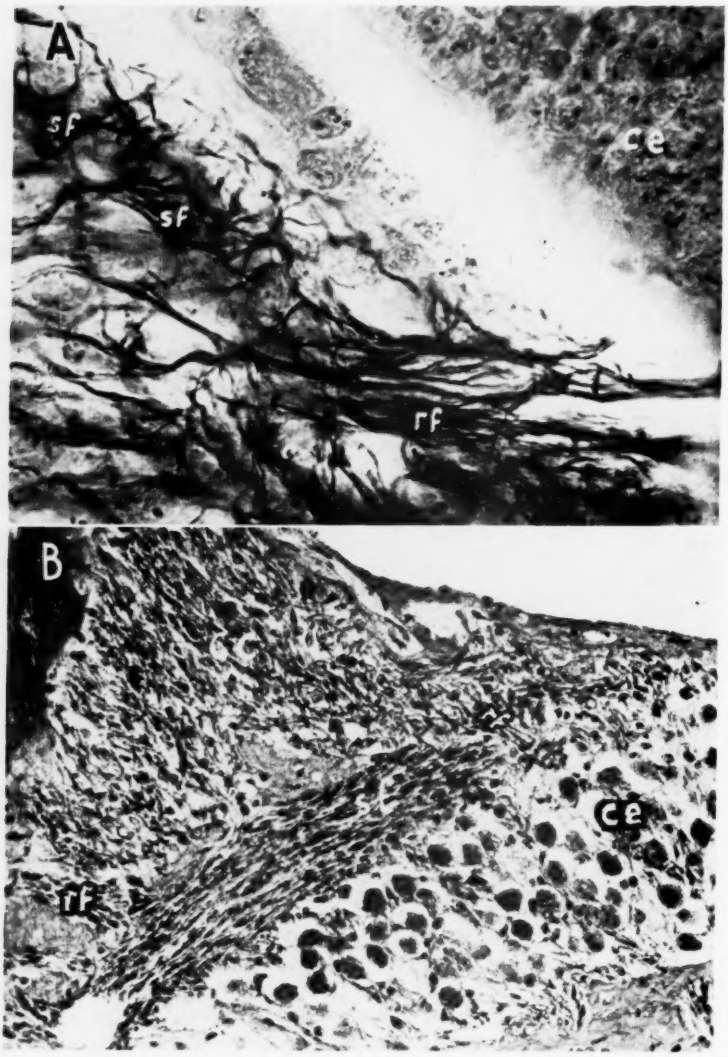

Fig. 7.—*A*, section of a rat embryo (Cajal stain); the plexus formed by spiral fibers (*sf*) and radial fibers (*rf*) near the apical coil of the cochlea strikingly resembles that observed in Figure 6*B* (× 1000).

B, horizontal section through the cochlea, middle coil, of a guinea pig embryo (Mallory stain); *GC*, ganglion cochleare; *rf*, radial fibers; *sf*, spiral fibers; *ce*, cochlear epithelium; the size, number, and staining properties of the spiral fibers are similar to those of the radial fibers, indicating their sensory character (× 300).

In addition, the comparative study of the inner ear of animals at different stages of zoological evolution, with the sensory function of the labyrinth progressively changing from merely static to vibratory and finally to that of tonal discrimination, makes it very logical to assume, even in the absence of anatomical evidence, that a certain mixture of the two auditory functions, protopathic (vibratory) and epicritical (tonal), may persist also in mammals in an organ which was primarily dependent on the static labyrinth (lagena) or in very strict connection with it (papilla basilaris).

The fact that the noncochlear fibers may be autonomic fibers running along the vestibular nerve and vestibulocochlear anastomosis (Oort's bundle) to the cochlea was not denied by me,[1] and it is unnecessary to discuss it after the excellent research of Rasmussen. The demonstration of autonomic cells or ganglions adjacent to the vestibular ganglion in birds and mammals afforded by Bruni and myself[6] lends further support to this view. Bovero[10] also demonstrated autonomic fibers in the vestibular ganglion. It is probable that many peripheral autonomic fibers reach the cochlea through the vestibulocochlear anastomosis.

However, I oppose the view of Portmann and Fernandez that all the spiral fibers are autonomic fibers because of the lack of anatomical and experimental evidence, physiological considerations, and the fact that the spiral fibers are too numerous; it is hardly conceivable that the cochlea would have such a massive autonomic innervation. In addition, these fibers do not accompany the blood vessels nor do they behave as typical autonomic fibers. Finally, their staining properties with the common stains are exactly the same as those of the radial fibers (Fig. 7 *B*).

My conclusion is that the spiral system of fibers must consist partially of fibers of vestibular origin and that it may contain a varying amount of autonomic fibers, probably of the postganglionic type, originating in scattered groups of autonomic cells or in isolated cells adjacent to the vestibular ganglion. Such fibers probably reach the cochlea together with the vestibular fibers by way of the vestibulocochlear anastomosis.

PHYSIOLOGICAL CONSIDERATIONS

The demonstration of the vestibular fibers supplying the cochlea raises the question of their physiological significance. Referring to conclusions expressed in my preceding article[1] regarding the hypothesis of a dual cochlear innervation, I should like to point out some common aspects of the pathology of audition which can be satisfactorily explained if the possibility of a vibratory, vestibular sensitivity of the cochlea is taken into account. Thus far, very little attention has been paid to these aspects.

It is a well-known fact that in cochlear deafness following diffuse degeneration of the organ of Corti (most often encountered in children) what remains of the auditory function is nearly always limited to a range of frequencies between 64 and 512 d. v.; on these frequencies thresholds by air conduction vary between 30 and 70 db., rising regularly from lower to higher frequencies. This low-frequency hearing is

10. Bovero, A.: Sulla fine struttura e sulla connessioni del Ganglio vestibolare del nervo acustico, Mem. Acc. Scienze-Torino-Serie II, Vol. **64:** 1914; Connessioni simpatiche del ganglio vestibolare del nervo acustico, Arch. ital. otol. **25:**41, 1914.

not due to the upper harmonics generated in the ear by low tones of high intensity, inasmuch as frequencies higher than 512 are not heard at all; it seems to point to the hypothesis that a strict localization for the low tones does not exist in the cochlea or that low tones, if they are sufficiently loud, may be heard even in the presence of widespread lesions of the organ of Corti.[11]

However, this hypothesis does not aid in the explanation of a very remarkable fact observed in the type of deafness referred to above. In low frequencies, up to 500 d. v., the bone thresholds are generally much lower (from about 40 to 50 db.) than the corresponding air thresholds. The discrepancy between air and bone conduction is surprising when it is remembered that the deafness is purely perceptive. This discrepancy cannot be explained but by assuming that the air thresholds are nothing but bone thresholds obtained by air conduction (the difference ranging from 40 to 50 db. between the two thresholds is highly suggestive of that). But it is even more surprising that bone conduction should be retained in the presence of a total loss of auditory function and that it should be totally absent at frequencies higher than 1,000 d. v. This type of bone conduction present in these cases seems to be dependent on some form of sensitivity which is in relation with only the vibrations reaching the bony capsule of the labyrinth directly by bone or air conduction. In fact, the vibratory components of hearing (noticeable also as a tactile sensation) are limited to frequencies up to about 750 d. v. However, this bone hearing is not, or at least not exclusively, a tactile sensation, as it maintains a rough, subjective character of pitch which is lost if the vibratory stimulus is applied elsewhere than to the skull.

At the same time it appears to be a type of hearing rather different from the common "cochlear" hearing. The discrimination of pitch is very rough, and never can this bone hearing, even in the best of cases, be used to reeducate the patient to recognize anything but a hint of the melody and rhythm of speech. It does not seem satisfactory for pure tone perception or tonal discrimination.

In my opinion the above-mentioned "bone hearing" in lower frequencies, being neither a cochlear nor a mere tactile sensation, could be ascribed to the vestibular fibers of the cochlea, whose anatomical demonstration has been afforded in the course of the present article. However, the possibility of the participation of the sacculus in this vibratory hearing (Tullio[12]) cannot be ruled out.

Additional support to my views is to be found in cases in which vestibular excitability is lost because of functional interruption of the vestibular nerve (cerebellopontine tumors) or severe hydrops of the labyrinth (Ménière). In these cases, not only are bone and air thresholds nearly the same, but very often bone hearing is completely absent on lower frequencies.

The hypothesis of "vestibular" hearing appears to be in accordance with the many clinical facts as well as with the physical, physiological, and phylogenetic considerations. "Vestibular" hearing in cases of total deafness can be considered the homologue of vibratory hearing in animals in which the epicritical sensory apparatus, cochlear nerve and its ganglion, have not yet been developed.

11. Symposium: Is There Localization in the Cochlea for Low Tones? Ann. Otol., Rhin. & Laryng. **44**:736-837, 1935.

12. Tullio, P.: Sul meccanismo dell'eccitazione fisiologica delle varie parti dell'orecchio interno, Atti XX Congr. Soc. it. Otolar., Bologna, 1923.

When the cochlear apparatus is sound, this "vestibular" hearing might well provide an auditory sensation with those "spatial" qualities formerly referred to by Kobrak,[13] possibly depending on the vibratory character of the low sounds.

The demonstration of vegetative fibers in the cochlea described by Rasmussen, Portmann, and recently, Bruni and myself, though of great importance, does not contribute much in explaining such phenomena as those described above. Their physiological importance probably invests problems related to intercochlear reaction, as suggested by Mayoux and Martin[14] and by Portmann. Nevertheless, the two matters do not seem to encroach on one another to any appreciable extent; they represent two aspects of a complex problem and may be of equally great interest in the future development of our knowledge of the physiology of hearing.

SUMMARY

In the course of comparative anatomical studies of serial sections of rat and chicken embryos, stained with the use of Cajal's method, the presence of vestibular fibers innervating the cochlea has been further demonstrated. The fibers form part of the spiral system of fibers of the cochlea.

An interpretation of the function of the vestibular fibers is elaborated, based not only on anatomical and phylogenetic evidence but also on well-defined clinical facts. Vestibulocochlear fibers are responsible for the perception of the vibratory stimuli; it may be regarded as a type of protopathic sensitivity as opposed to the epicritical sensitivity of the "cochlear" elements serving in tonal discrimination. This distinction between "vestibular" and "cochlear" hearing in the cochlea, anticipated by previous investigators, seems to be justified.

13. Kobrak, F., cited by Bocca.[1]

14. Mayoux, R., and Martin, H.: L'interdépendence auriculaire, Paris, Masson & Cie, 1952.

MALIGNANT NEOPLASMS OF THE PARANASAL SINUSES

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THE HIGH mortality rate of malignant neoplasms of the sinuses furnished the stimulus for the following study and preliminary report of 91 cases followed at the University Hospital, Ann Arbor, Mich., from 1932 to 1948. More recent cases are not included, because the outcome of many is still in doubt. Emphasis is placed on diagnosis, because it is here that much valuable time is lost before definitive therapy is begun. For this reason a large group of neoplasms involving the sinuses which are secondary to an obvious primary neoplasm of the skin are omitted. However, those which may have been primary in the alveolus are included.

There were 78 patients from 22 to 85 years of age and averaging 57 years of age who presented themselves with carcinoma. These varied from a well-differentiated medullary carcinoma, Grade I, arising in a papilloma, to highly anaplastic growths classified only as poorly differentiated malignant neoplasms, probably of squamous cell origin, and some in more recent years classified as lymphoepitheliomas. There were five primary adenocarcinomas; two pseudoadenomatous basal cell carcinomas; "cylindromas" related to mixed salivary gland tumors; one malignant mixed salivary gland tumor, primary in the antrum and palate, and one basal cell carcinoma without an external skin lesion.

There were 11 patients with sarcoma, averaging 32 years of age but ranging widely from an infant of 1 year to a man 81 years of age.

We will consider these different neoplasms as a single group to conveniently discuss symptomatology as an aid in diagnosis. In 24 cases the first symptom remembered by the patients at the onset of the disease was swelling about the cheek, nose, eye, or forehead. The next commonest first symptom was pain in 23 cases. The description of pain varied from discomfort and soreness to sharp stabbing pain present either over the sinus involved or referred to the frontal, parietal, or occipital regions; teeth; eye, or retrobulbar area. Nasal obstruction was the first symptom in 14 patients and was almost invariably unilateral. Oral symptoms were present in 10 patients. These symptoms consisted of soreness or swelling of the gums, noticing that the dentures suddenly failed to fit or that an oroantral fistula with bad-tasting discharge was present. Nasal discharge was complained of by eight patients. This varied from clear and watery to foul and yellow or occasionally blood-tinged. Frank epistaxis or bloody tinging of the nasal secretions was noticed by four patients. Two people complained of unilateral tearing. In one person each the following symptoms were noticed first: diplopia, unilateral facial paralysis, earache, unilateral deafness, proptosis, and numbness of the cheek.

It is remarkable that swelling and pain were the most frequently given first symptoms, because obviously these are not early symptoms. Nash, 1935 and O'Keefe and Clerf, 1946, also concluded that late treatment is the result of the late appearance of symptoms. The latter two workers report on 47 cases, all ending fatally. The symptoms of swelling and pain indicate an advanced growth that has expanded or infiltrated bone and caused pressure and invasion of the nerve within or external to the sinus of origin. Did the neoplasm without symptoms fill the sinuses and nasal cavity, or are there early, little-noticed, or not remembered symptoms for which the public should be educated to seek early medical attention? Probably the two situations exist. It seems likely that unilateral nasal discharge, unilateral obstruction, flecks of blood in the handkerchief, and epistaxis in previously healthy people past middle age are the neglected warning signs. Lachrymation occurring as the first symptom in two cases suggests origin in the nasolachrymal duct and may be an early symptom. All the other symptoms are undoubtedly late.

At the time of diagnosis the total symptoms in decreasing frequency were pain, swelling, nasal obstruction, discharge, appearance of blood, mouth symptoms, diplopia, proptosis, loss of vision, lachrymation, numbness of the cheek, loss of hearing, ptosis, protrusion of a growth from the nostril, trismus, facial paralysis, cervical tumor, earache, and tinnitus. It is interesting that pain and swelling still head the list, showing that at the time of admission the lesion is far advanced. However there is much more frequent mention of unilateral nasal obstruction, discharge, and blood. Even at this time some of the patients fail to mention these symptoms, because they are preoccupied by pain, external deformity, or other serious late symptoms, such as blindness. But questioning or examination of the patient usually supported the presence of the early and mild nasal symptoms.

To confuse the diagnosis, 12% had symptomatic preexisting noncancerous pathology for several months to 50 years. This included allergic rhinitis, nasal polyposis, sinusitis, draining oroantral fistula, and tooth extraction with a residual root fragment present. The percentage of asymptomatic preexisting pathology is probably much higher and no doubt significant in the etiology of cancer but is difficult to prove.

The average patient consulted his physician three months after the onset of symptoms and was first seen for definitive therapy by an otolaryngologist seven and one-half months following the onset. In this four and one-half-month period 85 patients had received no treatment pertinent to the neoplasm and are divided into three groups. In the first group of 36 patients, although the diagnosis was missed, the patients were treated by incision and attempted drainage, reassurance, extraction of teeth, reshaping of dentures, fitting of glasses, use of nose drops, pain pills, and so forth. Of the second group, 34 patients were referred for definitive therapy without any treatment and some without the diagnosis being made. The advice given to 15 patients is not known, the patient apparently procrastinating or refusing hospitalization. The remaining six were referred after recurrence following x-ray therapy or excision.

The differential diagnosis from infection, allergy, chronic infectious granuloma, and benign tumor was made by the usual examination, blood studies, sinus x-rays, and biopsy, and in eight more recent cases by the Papanicolaou smear. The latter method was uniformly positive when the tumor mass was obvious in the nose and,

with one exception, negative when not obvious. Although these are too few cases from which to draw any definite opinion, it would seem that this method of diagnosis was not of great help and that, when in doubt, exploration is justified, as advocated by Schall, 1934. In this connection, Heatley, 1951, calls attention to the frequently occurring secondary infection which may obscure the diagnosis, and he feels that exploration is always justified and indicated in doubtful cases. Fitz-Hugh and co-workers, 1950, in studying antral washings with the Papanicolaou smear, found six cases of carcinoma in 72 patients, but also in all these the diagnosis was obvious from other methods of diagnosis. Although this procedure affords interesting opportunities for investigation, it could hardly be recognized as a useful aid at the present time. Perhaps in the future this or a similar procedure may yield an early diagnosis.

The location and extent of involvement defied easy classification and represented 32 combinations of antrum, ethmoid, sphenoid, and frontal sinuses; nasal cavity; nasopharynx; alveolus; palate; orbit; intracranial structures; cheek, and pterygomaxillary and infratemporal fossae. All but 17 neoplasms involved two or more of the above structures. Öhngren, 1937, in reporting 35% five-year survival of 120 patients with cases of carcinoma of the upper jaw only, pointed out that lesions of the sinuses located posteriorly and medially (where electrosurgical treatment is the most dangerous) gave the poorer prognosis.

Even with such extensive local growth at the end of seven and one-half months, only 8% showed metastatic cervical lymphadenopathy and only 1% pulmonary metastasis. With metastasis occurring relatively late, there is afforded a welcome interval for attempted control of the primary neoplasm.

The treatment was by excision, electrocoagulation, actual cautery, x-ray, or radium, that is, by one or a combination of these methods. Nearly all received some form of irradiation. The results were divided into four groups. In the first group recurrences developed in 67 after an average of seven and one-half months, and, if not considered hopeless, they were re-treated. The average survival in this group was 18 months. In this group of recurrences, with eventual death, one patient had fatal recurrences after 10 years, five patients after 5 years, and one patient after 3 years.

The second group consisted of six patients who received no treatment other than symptomatic care, either because they were considered hopeless or by their own choice. Average survival in this group was nine months.

The third group of five patients died of other causes within a three-year period or could not be followed longer than three years.

The fourth group, with no evidence of recurrence of neoplasm at the end of three years, numbered 13 patients. Of these, four died of other causes, and two could not be followed for five years. Seven patients survived five years. Of these, five were reported living and well and two as merely having no recurrence. Several in this group have reached their 10th year.

Thus there was a 22% three-year survival rate and a 14% five-year survival rate.

There was little or no correlation between the type of malignant neoplasm and the prognosis, except that the pseudoadenomatous basal cell lesion allowed a more favorable outlook.

COMMENT

A close study of these 91 patients revealed that in the successful cases the patients had received treatment by a combination of methods: surgery, cautery, and irradiation. The cautery, either actual or high-frequency electric, was usually used at the time of the original surgical approach, and the irradiation was administered externally later. However, the approach was varied to suit the individual situation. That some form of combined therapy has achieved the best results is amply in evidence in the literature. Nash, 1935, stressed the association of operation, particularly for drainage and irradiation, upon which he felt most reliance should be placed. New, 1938, has made a plea for radical excision by cautery, surgical diathermy, and irradiation, regardless of the resultant deformity. He favored the lateral rhinotomy or oral approach, treating the lower grade neoplasms with diathermy and the more anaplastic ones by removal of enough tissue for drainage and then radium insertion. Schall, 1948, in reporting on 219 patients with 30% five-year survivals, emphasizes examination of all tissue removed from the nose, for instance polyps, and prompt and thorough treatment. He apparently favors lateral rhinotomy of a modified Moure type, with cutting electric current for nasal, ethmoidal, and even antral, sphenoidal, and frontal exenteration and radium insertion. He reserves the Caldwell-Luc approach for those with alveolar involvement. Worth repeating is his statement that the inferior antral carcinoma produces early swelling and fistula; whereas the posterior and superior carcinoma produces pain in the cheek and teeth, with such a patient frequently presenting himself with one or more teeth extracted. He feels that in the poorly differentiated lesion, surgery should be limited to drainage, if infection is present. His results show that those treated primarily by surgery have better than a two to one chance for survival over those treated primarily by irradiation. Figi, 1938, in reviewing his series of patients with 40% five-year survivals of primary antral carcinoma and 53.4% five-year survival of patients with the primary neoplasm in the maxilla treated by a combination of liberal electrocoagulation and radium, describes the common deformities resulting from treatment. He advocates repair no earlier than one year after treatment, so that any recurrence will be obvious to external or intraoral inspection. Spencer and Black, 1938, advocate combined treatment but point to the high mortality of resection of the superior maxilla.

Wilkins, 1952, also points out that combined methods of treatment have produced the highest reported cure rates, with some as high as 40% five-year survivals. He indorses radical surgical resection of the maxilla with follow-up irradiation. This procedure is advocated, very well described, and illustrated by Schuknecht, 1951, and is gaining in popularity rapidly because of improved supportive surgical care, with the control of infection with antibiotics, careful whole blood, fluid, and electrolyte replacement therapy, as well as improved cosmetic results in repair and prosthesis. It is important that one should not lose sight of his recommendation for "inherently benign tumors," such as adamantinoma or mixed salivary gland tumor, for a simple lateral rhinotomy, without incising the lip, or a wide Caldwell-Luc approach.

CONCLUSION

The symptoms suggesting carcinoma of the sinuses are swelling or pain about the face, unilateral nasal obstruction and drainage, oral symptoms, and epistaxis.

Diagnosis is made by the history; minute anterior and posterior rhinoscopic examination; nasopharyngoscopy; x-rays with iodized oil, if needed; antral irrigation; Papanicolaou studies; biopsy, and exploration, if inaccessible.

The treatment depends upon the extent, type, and location of the neoplasm; the presence of metastasis, and the age and condition of the patient. In most instances surgery was the primary treatment, with later irradiation if the tumor was radiosensitive. If a biopsy can be easily obtained preoperatively, then irradiation prior to surgery has the advantage of lessening vascularity, sealing lymphatic channels, and reducing the size of the lesion. It should be emphasized that repeated treatment of these lesions may be necessary and may result in cure, because they are reasonably slow to metastasize. More radical methods are gaining wider acceptance because of increased safety and greater probability of cure.

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FOREIGN BODIES IN THE FOOD AND AIR PASSAGES

Survey of Cases at an Army General Hospital

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THE SUBJECT of foreign bodies in the air and food passages is always a source of human and dramatic interest as well as of clinical interest. However, appreciation of the importance of foreign bodies in the air passages was not particularly noted until the early part of the nineteenth century.

In a review of the history of this subject, Clerf [1] mentions significant individual contributions in the development of the subject as it is known today. For a more detailed description, it is well to refer to that article as well as to the original articles. A very brief, incomplete résumé and a simple table (Table I) to illustrate the history are added here.

In about 460 B.C., Hippocrates advocated placing a tube in the larynx and trachea to prevent asphyxiation, and, although he mentioned some details in the examination of the chest, the first general acceptance of a method for such examination was not until after Skoda's investigations in 1839. Earlier recordings of foreign bodies in the air and food passages have been found, such as the incidence of sudden asphyxiation of fishermen who habitually held fish they had caught between their teeth.

Verduc, in 1717, mentioned bronchotomy for the removal of a bone from the trachea of a patient. In 1795, Bonzini attempted an esophagoscopy. While passing a feeding tube, Desault, in 1801, accidentally inserted it into the trachea, indicating that the trachea could tolerate such a tube. Green, in 1828, used a catheter to place medication in the trachea and was ostracized by colleagues at that time for advocating the procedure. Note must be made of the treatise on foreign bodies published by Gross in 1854, for this treatise still stands as a monument to the keen observative powers of the men of that era. Although Fisher had attempted using a candle as a source of light to perform indirect laryngoscopy in 1825, it was not until 1854 that Garcia first successfully performed the procedure with his invention of the laryngeal mirror. By 1890, Mackenzie had developed a skeleton-type esophagoscope. In 1895, Kirstein performed direct laryngoscopy but warned of the dangers of passing the tube too far when he noted the pulsations in the lower tracheal wall. In the same year Killian, utilizing the fundamental principles laid down by Kussmal in this field, did a successful bronchoscopy with a 9-mm. tube. In 1897, Killian removed a foreign body from the lower air passages with such a

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1. Clerf, L. H.: Histological Aspects of Foreign Bodies in the air and Food Passages, Ann. Otol. Rhin. & Laryng. **61**:5-17, 1952.

tube. A year later Collidge employed a urethroscope to remove a tracheal cannula from the bronchus for the first recorded removal of a foreign body by this method in the United States. By 1902, Einhorn had made a significant contribution by adding distal illumination to an endoscope. Utilizing this instrument and the Killian tube, Ingels, Mosher, and Jackson within the next few years also reported successful foreign-body removals. It is interesting to note that the patient was placed in a sitting position and that this use of the tube introduced the O'Dwyer technique. To Jackson must go the credit for developing the instrumentarium and for making both the medical profession and the public "foreign-body conscious."

TABLE 1.—*History of Peroral Endoscopy*

Date	Name	Contribution
460 B. C.	Hippocrates	Conceived intubation idea
1717 A. D.	Verdue	Used bronchotomy for removal of a bone
1795	Bonzini	Attempted first esophagoscopy
1801	Desault	Passed feeding tube into trachea by accident
1825	Fisher	Used candlelight in indirect laryngoscopy
1828	Green	Used catheter to place medication in trachea
1854	Gross	Published treatise on foreign bodies
1854	Garcia	Invented laryngeal mirror
1890	Mackenzie	Developed skeleton-type esophagoscope
1895	Kirstein	Performed first direct laryngoscopy
1895	Killian	Performed bronchoscopy with 9-mm. tube
1897	Killian	Removed foreign body from lower air passages
1898	Collidge	Performed first bronchoscopy in U. S. at Mass. Gen. Hosp., using urethroscope to remove tracheal cannula
1902	Einhorn	Added distal illumination to endoscope
1904	Ingels	Reported two removals of foreign bodies
1905	Jackson	Reported removals of foreign bodies by using O'Dwyer technique, with patient in sitting position

INCIDENCE AND TYPES OF FOREIGN BODIES IN THE AIR AND FOOD PASSAGES

As has been so noted and adequately stated by Jackson,[2]

No statistics of incidence of *endogenous* foreign bodies in the air and food passages are available, and it is inconceivable that they ever will be. Their incidence in the air passages is countless millions. Spontaneously expelled endogenous foreign body accumulations of exudates are of common incidence in practically every case of acute or chronic disease of the bronchi. By comparison, only a few are removed bronchoscopically, and, of course, spontaneous expulsion by cooperative tussive squeeze, bechic blast, and ciliary action are so efficient that laryngoscopic or bronchoscopic aspiration is not indicated. No systematic records of bronchoscopic forceps removal of foreign-body crusts, sequestra, obstructive clots of blood, exudate, and similar endogenous foreign bodies have been kept in any clinic.

Foreign bodies reaching the bronchi by *penetration of the chest wall* are in most cases metallic, such as bullets and parts of the case or contents of fragmentation shells, but they not infrequently carry in with them bits of textiles from clothing, tents, or bedding. Many such cases occurred during World War II not only in battle casualties but also among civilians in bombed cities. In some of these cases the location and size of the missile permitted bronchoscopic removal through the mouth. An accidentally penetrating bullet in a civilian was removed bronchoscopically by Chevalier Jackson. *Inspirated and swallowed exogenous foreign bodies in the air and food passages* include almost all the substances or parts of substances with which human beings commonly come in contact, within the limits imposed by the size of the invaded passages.

2. Jackson, C., and Jackson, C. L.: Bronchoesophagology, Philadelphia, W. B. Saunders Company, 1950, p. 13.

The etiological factors are many. In the young age group, the most serious offender is vegetable matter, particularly peanuts or beans. Out of 1,485 patients with bronchoscopic foreign bodies observed at Jackson Clinic,[3] 200 had their first symptoms after asymptomatic intervals ranging from 1 month to 40 years. This accentuates the importance of putting patients through the usual diagnostic steps when their histories reveal any suggestion of the presence of a foreign body. This is particularly true when the patient is a young child. Twenty-two out of 32 patients in the Walter Reed Army Hospital in the 0 to 20 year age group were below the age of 3.

Table 2 gives a breakdown of recorded foreign bodies encountered at Walter Reed Army Hospital for the period from April, 1947, to Feb., 1953, and includes

TABLE 2.—*Recorded Cases of Foreign Bodies Removed from the Pharynx, Larynx, Esophagus, and Tracheobronchial Tree at Walter Reed Army Hospital from April 8, 1947, to Feb. 6, 1953*

Age, Yr.	Distribution by Sex	
	Male	Female
0-10	19	10
10-20	2	..
20-30	7	3
30-40	1	3
40-50	1	3
50-60	1	2
60-70	..	1
70-80	1	..

TABLE 3.—*Distribution of Foreign Bodies by Age and Location*

Age, Yr.	Esophagus	Bronchus	Hypopharynx	Larynx	Trachea
0-10	15	9	3	1	1
10-20	2	..	..	1	..
20-30	9	2	..	1	..
30-40	2	1	..	..	..
40-50	2	..	..	..	..
50-60	3	..	..	..	..
60-70	1	..	..	..	..
70-80	1	..	..	..	..

the incidence for sex and age groups. In Table 3 the distribution by location and age group is given. Table 4 shows the types of foreign bodies encountered. In this table, one case of a patient with a piece of plastic toy in the larynx has been previously reported, and one patient had to have a bronchotomy for removal of a paw of a china dog after attempts at bronchoscopy were futile.

SUMMARY

A brief review of the significant historical events in the development of our present knowledge of the removal of foreign bodies from the air and food passages is offered. Cases of foreign bodies recorded at an army general hospital, classified according to location, sex, age group, and type, and covering an approximate six year period are presented in the form of tables.

3. Jackson,[2] p. 16.

ENDOSCOPIC REMOVAL OF A BRONCHIAL ADENOMA

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THERE was only one case of bronchial adenoma among the cases of bronchial tumor observed in Turkey since 1947. The history of the case and the endoscopic procedure used were as follows.

REPORT OF A CASE

Mrs. M. A., the 28-year-old wife of a military doctor, came to the Istanbul Naval Hospital with a complaint of a pain of 15 months' duration on the right side of her chest. According to previous records from other hospitals, she had become ill in February, 1948, with a sudden pain in the right side of her chest, fever, chills, and mucopurulent expectoration. A previous clinical examination had revealed harsh breathing sounds and subcrepitant rales in the right armpit. Diagnosis of pneumonia was made, and penicillin treatment was given with sulfanamides and streptomycin. Although the patient had been given 120 million units of penicillin, 50 gm. of sulfanamides, and 20 gm. of streptomycin in 15 months, her complaints continued, except for short intervals of slight improvement. Because of the presence of blood in her sputum on the tenth day of her illness, tuberculosis was suspected, but this suspicion was not confirmed by any test in spite of a thorough search. X-ray examination revealed a large atelectatic area in the right lower and middle lobes.

The patient was hospitalized on April 4, 1949, at the Istanbul Naval Hospital. On the same day a bronchoscopic examination was made with a 7 mm. by 40 cm. Jackson bronchoscope. A smooth-surfaced tumor was observed at the junction of the right main bronchus, with the bronchus supplying the lower lateral segment. It was attached to the inferior edge of this orifice, which was enlarged and filled with purulent discharge. A biopsy specimen was taken and sent for histopathological study to Professor Schwartz, Director of the Department of Pathology, Istanbul University. Repeated examinations of the serial sections revealed a solid adenoma which was nonmalignant (Fig. 1).

On April 25, 1949, with the patient under ether anesthesia, the tumor was removed endoscopically by cutting forceps, but part of the base of the tumor, which was rather broad, was left in place, for removal at a second operation. After this procedure the patient felt very well. In a few days she was free from all her complaints and symptoms and therefore did not consent to another attempt. X-ray films taken before bronchoscopy and a year after the removal of the tumor are shown in Figures 2 and 3.

On Dec. 30, 1951, thirty-two months after the operation, the patient came back and complained that for the past few days she had had symptoms similar to those of the previous illness. This time she was hospitalized at the Medical Faculty Ear, Nose and Throat Department of Istanbul University. With the patient under local anesthesia, the bronchoscopic examination was repeated, the growth removed, and the base thoroughly cauterized. The patient was perfectly well in two days, was discharged, and has since reported no postoperative complaints.

Read before the First National Congress of the Turkish Otorhino-Laryngologic Society, Istanbul, Oct. 4, 1951.

From the Istanbul University Medical Faculty Ear, Nose, and Throat Department (Professor E. B. Tezel, Director), and formerly at the Department of Otolaryngology, Presbyterian Hospital, New York.

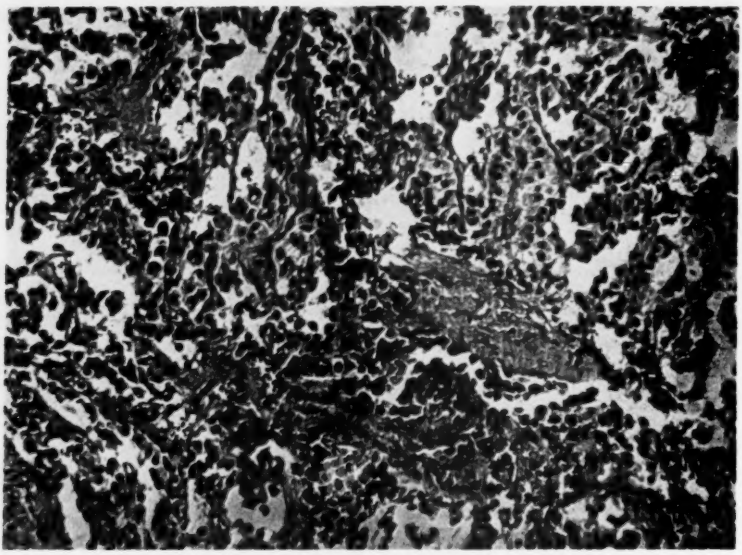

Fig. 1.—Solid nonmalignant adenoma.

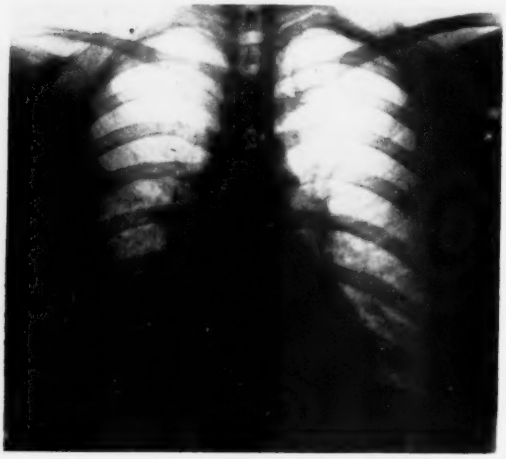

Fig. 2.—Shadow in right lower lobe before removal of tumor.

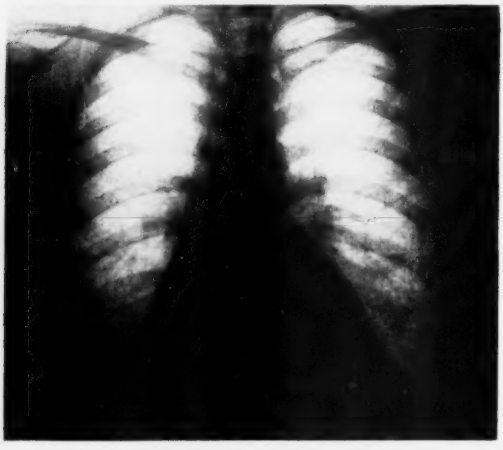

Fig. 3.—One year after removal of tumor.

SUMMARY

A 28-year-old woman who had been ill since February, 1948, with a pain on the right side of her chest came to the Istanbul Naval Hospital. She had been given large doses of penicillin, sulfonamides, and some streptomycin without benefit, the condition having been mistaken for pneumonia. From the x-ray films and history, an obliterating condition was suspected. A bronchoscopic examination was performed, and a biopsy specimen was taken from a smooth-surfaced tumor found in the right lower bronchus. The diagnosis, as established by histological study, was a solid nonmalignant adenoma. On April 25, 1949, the tumor was removed endoscopically, and the patient became well.

On Dec. 30, 1951, the procedure was repeated, with radical removal of the tumor and cauterization of the remnant and of the part which had grown since the first removal.

CORRELATION OF CLINICAL OTITIS EXTERNA WITH MYCOBACTERIOLOGIC STUDIES

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OTITIS externa still presents a problem to the otolaryngologist. The gamut of therapeutic procedures employed in the treatment of this condition substantiates this opinion. Hot and humid weather conditions greatly increase the incidence of otitis externa. During the last war I had an opportunity to study this disease while stationed in a tropical climate in the Solomon Islands. During one year 620 cases of acute and chronic infections of the external canal of the ear were examined and treated in our hospital and clinic. In addition, several hundred cases were examined on other islands in the Solomon group. In all, more than 1,000 cases were observed. The high incidence of otitis externa in tropical climates has been reported by other observers. Quayle [1] reported an incidence of 50% of otitis externa in the ear, nose, and throat conditions among Australian troops in a hospital in New Guinea. Collins [2] encountered this condition in 34% of the ear, nose, and throat conditions observed in troops in the Middle East. Daggett [3] reported that 48% of all the cases of ear infection observed in Malta were otitis externa. Reeh [4] found this condition very prevalent in the Canal Zone. In our clinic over a period of a year otitis externa comprised 32% of all the ear, nose, and throat conditions.

Many observers have made thorough bacteriologic studies of otitis externa. Only a few, among them Senturia,[5] have attempted to correlate the clinical picture of this disease with the bacteriologic findings. The purpose of this study was to attempt such a correlation. If a definite bacterial flora could be accurately determined for the various types of otitis externa encountered, both the diagnosis and the specific therapy would be greatly simplified, especially when bacteriologic studies could not be conveniently made. In order to carry out this study the bacterial and fungous flora of the normal external auditory canal was determined in 73 ears. The second part of the study was to determine whether an accurate diagnosis of bacterial and fungous otitis externa could be made from the clinical picture alone.

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1. Quayle, A. F.: Otitis Externa in New Guinea, M. J. Australia **11**:228 (Sept. 2) 1944.

2. Collins, E. G.: Ear, Nose, and Throat Casualties in a General Hospital in the Middle East, Brit. M. J. **2**:386 (Sept. 25) 1943.

3. Daggett, W. J.: Desquamative Otitis Externa in Malta, J. Laryng. & Otol. **57**:427 (Oct.) 1942.

4. Reeh, M. J.: Treatment of Otomycosis, Ann. Otol. Rhin. & Laryng. **51**:146 (March) 1942.

5. Senturia, B. H.: Etiology of External Otitis, Laryngoscope **55**:277 (June) 1945.

A group of 113 cases were so diagnosed and checked with mycobacteriologic studies. The third part of this investigation was to culture and study each distinctive type of this disease to determine whether it had a distinctive mycobacteriologic flora. One hundred twenty cases were studied in this manner.

Materials from 73 normal external auditory canals were cultured from personnel who gave no history of having had any diseased condition of the external or middle ear. The findings of this group are given in Table 1. The organism most commonly found was the Staphylococcus albus, grown in 64 (88%) of the cultures. The group that ranked second was the Gram-positive aerobic spore-forming bacilli, found in materials from 25 (33%) ears. These organisms are nonpathogenic and are usually considered contaminants. Diphtheroids were found in 16 (22%) and Staphylococcus aureus in 11 (15%) of the cultures. There were four (5.4%) normal ears which had the Gram-negative Bacillus pyocyaneus (Pseudomonas

TABLE 1.—*Mycobacteriologic Findings in 73 Normal External Ears*

	No.	%
Bacteria		
Staphylococcus albus	64	88
Staphylococcus aureus	11	15
Diphtheroids	16	22
Gram-positive aerobic spore-forming bacilli	25	33
Gram-negative bacilli		
B. pyocyaneus	4	5.4
Coliform	3	4.1
Beta hemolytic streptococci	1	1.3
Fungi		
Molds		5.4
Aspergillus		
Glaucus	1	
Candidus	1	
Flavipes	1	
Penicillium	1	
Yeast and yeast-like organisms		4.1
Cryptococcus	1	
Unidentified	2	

aeruginosa). Fungi were isolated from seven (9.5%) of the control specimens; four (5.4%) belonged to the molds, of which three were of the Aspergillus group and one Penicillium. Three (4.1%) belonged to the yeasts and yeast-like organisms. Only one of these, Cryptococcus (Torula), could be identified. These findings compare rather favorably with those of other observers. Senturia [5] found the Staph. albus in 80% of his normal group, and diphtheroids, Micrococcus tetragenus, and Staph. aureus were the next most commonly found. Aspergilli were found in 3% of the controls. Syverton and his associates [6] reported micrococci in 81% and Staph. albus and diphtheroids in 62% of their normal cases. Haley,[7] reporting on 106 normal ears, stated that Staph. albus, Bacillus subtilis, and the diphtheroids were most commonly found. Friedman and Hinkel [8] reported similar findings. Recently,

6. Syverton, J. T.; Hess, W. R., and Krafchuk, J.: Otitis Externa: Clinical Observations and Microbiologic Flora, Arch. Otolaryng. **43**:213 (March) 1946.

7. Haley, L. D.: Etiology of Otomycosis: Mycologic Flora of the Ear, Arch. Otolaryng. **52**:202 (Aug.) 1950.

8. Friedman, H. S., and Hinkel, C. L.: External Otitis: A Study of the Comparative Merits of Medical and Roentgen Therapy, Arch. Otolaryng. **33**:749 (May) 1941.

Singer and his associates,[9] reporting on 1,377 normal ear cultures, found the Staph. albus, both the hemolytic and the nonhemolytic type, in 90% of their cultures, both types of Staph. aureus in 15%, and spore formers in 13%. The Pseudomonas (B. pyocyaneus) was found in only 1% of the cultures. They also reported finding the Aspergillus and Alternaria in 4% of the normal ear cultures and the Curvularia in 6%. Wolf [10] and Haley [7] reported fungi from various groups, including the Aspergillus, Penicillium, Mucor, and other yeast-like organisms, in the normal ear canal.

The next part of this investigation was to determine whether an accurate clinical diagnosis of the bacterial and fungous types of otitis externa could be made before the culture study. The clinical diagnosis was made first, and then material from each ear was cultured to determine whether the diagnosis was correct. The two main types of pathology encountered in the bacterial group were the acute diffuse edematous type and the purulent exudate type. The acute diffuse edematous type has been described as desquamative otitis externa by Quayle,[1] as the "hot weather ear" by Morley,[11] and, recently, as the diffuse otitis externa by Senturia.[12] This type of infection occurs in hot humid weather, starting usually in the mild cases with itching. Pain and tenderness on pressure or with movement of the auricle soon follow. In the mild cases only slight redness of the canal may be noted, with a variable amount of edema of the canal walls, which are coated with adherent secretion or desquamated material. In the severer cases the pain increases, and the edema becomes more diffuse, the external canal eventually becoming entirely occluded. Desquamation increases, and a thin watery secretion is found deep in the canal. Periauricular edema and constitutional symptoms of fever and malaise may also be present. Senturia [12] described the skin of the canal as being thickened and purplish red in color and having a goose-flesh appearance. This type of case usually ran its course in 10 to 14 days if untreated but invariably recurred if treatment either was not instituted or was inadequate. The lining of the canal may remain red for a variable period. Daggett [3] divides this type into three stages: the acute, subacute, and chronic. Morley [11] adds a fourth stage, the relapsing stage. I was never able to divide these cases into the various stages, as their course with adequate therapy was short and the recurrences usually manifested themselves as acute conditions again. However, the other type of otitis externa encountered, especially in troops in combat areas, might be considered a subacute or chronic stage of the acute cases. This was named the purulent exudate type.

The purulent exudate type of otitis externa, as stated before, may be the subacute or chronic stage of the edematous or desquamative otitis externa. This condition manifests itself with a sensation of fulness in the affected ear, variable itching, and very little, if any, pain or tenderness. The external canal may disclose only

9. Singer, D. E.; Freeman, E.; Hoffert, W. R.; Keys, R. J.; Mitchell, R. B., and Hardy, A. V.: Otitis Externa: Bacteriological and Mycological Studies, Ann. Otol. Rhin. & Laryng. **61**:317 (June) 1952.

10. Wolf, F. T.: Relation of Various Fungi to Otomycosis, Arch. Otolaryng. **46**:361 (Sept.) 1947.

11. Morley, G.: Otitis Externa: "Hot-Weather Ear": Investigation of 100 Cases and Method of Treatment, Brit. M. J. **1**:373 (Feb. 19) 1938.

12. Senturia, B. H.: Diffuse External Otitis: Its Pathology and Treatment, Tr. Am. Acad. Ophth. **55**:147 (Nov.-Dec.) 1950.

moderate infection, slight thickening or swelling of the canal walls, which is also a variable finding, and, at times, some desquamation of the drum membrane obliterating the landmarks. The characteristic finding is a definite purulent discharge which is usually thick, gray or pale green in color, having at times a sickening sweet odor, and associated with a variable amount of desquamative debris. My associates and I were not able to classify this type of case accurately, as it was not encountered too frequently in our cases. However, on other islands I observed these cases, and most of them were of long standing. I was inclined to believe that they were actually the subacute and chronic stages of the acute edematous type. Daggett [3] and Morley [11] described similar cases as subacute and chronic types of the acute condition, and Senturia [12] described similar cases as the chronic stage of the acute type.

The third type of otitis externa encountered was the fungous, or otomycosis, which may occur as either a dry or a moist infection of the external canal. The symptom most commonly observed is itching of the ear which is associated, at times, with a sensation of fulness in the ear and even with impaired hearing when the desquamated debris fills the canal and encroaches on the drum membrane. A dull ache or slight pain as well as a slight discharge may be present, but these findings are not common. On examination one may find either a dry or moist type of infection. In the dry state one may encounter a fine branny desquamation, an actual mold growth springing from the lining of the canal, usually the floor, or a growth on a plug of cerumen. This growth may appear as a black mass, black-speckled or yellowish-tinged or, at times, as a white cotton-like film. The dry epithelial debris may take the form of a large cast filling the external canal. The dry type, as a rule, produces very few symptoms. The moist type is more commonly found and more annoying. In this type considerable debris and desquamation are found in the external canal, at times associated with a slight discharge. This material re-forms rather rapidly, even after the ear has been thoroughly cleansed. It may appear as wet blotting paper or as large masses of wet pulpy material, at times having a foul odor. The material may at times be dark in color or have the characteristic black-speckled appearance. Some discharge may be present with a variable dermatitis of the underlying canal walls. The clinical picture is not always characteristic and may even be associated with the acute bacterial otitis externa or a secondary otitis media. The fungous type has a tendency to recur and to become chronic if improperly treated.

One hundred thirteen cases were studied to determine whether an accurate diagnosis could be made from the clinical picture alone. Sixty-three were in the bacterial group, which was made up of cases having the clinical findings of the acute edematous type and the purulent exudate type. Fifty cases were diagnosed as fungous disease. These had the fairly classic picture of otomycosis, which was just described. The culture investigation is presented in Table 2. Forty-seven (74.6%) of the 63 cases diagnosed as bacterial otitis externa had bacteria alone, and 16 (25.6%) had fungi with other bacteria. In the fungous group, 34 (68%) of the 50 cases had fungi. All except three (6%) were associated with other bacteria. Sixteen (32%) of this group had bacteria alone. An accurate diagnosis was made in about 75% of the cases in the bacterial group and in 68% in the fungous group. A further analysis of the culture studies is presented in Tables 3 and 4. The most frequently isolated organism in the bacterial group was the B. pyocyaneus (Ps. aeruginosa), which was found in 51 (80%) of the cultures. The next most fre-

quently found organisms were the Staph. albus, 46%, the Staph. aureus, 13%, and the diphtheroids, 13%. In the fungous group, the Staph. albus was found most frequently, 58%; next were the B. pyocyaneus, 30%, the diphtheroids, 20%, coliform bacilli, 19%, and the Staph. aureus, 14%. In comparing these results with the normal group, one can observe that the Gram-negative B. pyocyaneus (Pseudomonas) is the most commonly found organism in the bacterial type of infection.

TABLE 2.—*One Hundred Thirteen Cases of Otitis Externa Clinically Diagnosed and Verified by Culture Studies*

Otitis Externa, Type	Patients, No.	Bacteria Patients		Fungi Patients		Bacteria and Fungi Patients	
		No.	%	No.	%	No.	%
Bacterial	63	47	74.6	0	0	16	25.6
Fungous (otomycosis)	50	16	32	3	6	34	68

TABLE 3.—*Culture Analysis of Specimens from Ears with Otitis Externa and from Normal Ears*

Clinical Diagnosis	Specimens, No.	B. Pyocyaneus	Coliform	Proteus	Staph. Aureus	Staph. Albus	Beta Hemolytic Streptococci	Nonhemolytic Streptococci	Diphtheroids	Gram-Positive Aerobic Spore-Forming Bacilli
Fungous otitis externa	50	15	9	2	7	29	0	0	10	6
Bacterial otitis externa	63	51	1	1	8	27	2	1	8	3
Normal	73	4	3	0	11	64	1	0	16	25

TABLE 4.—*Frequency of Isolation of Fungi*

Specimens, Type	Specimens, No.	Fungi, Total No.	Fungi, Type: Molds: Aspergillus, Total No.	Aspergillus: Glaucus	Fumigatus	Sydowi	Flavipes Group	Candidus	Niger	Unidentified	Penicillium	Trichophyton	Yeasts and Yeast-Like Organisms: Candida (Not Albicans)	Cryptococcus	Unidentified
Fungous otitis externa	50	34	20	2	4	1	0	4	6	3	1	2	6	3	2
Bacterial otitis externa	63	16	8	1	0	0	1	3	3	0	0	0	4	1	3
Normal	73	7	3	1	0	0	1	1	0	0	1	0	0	1	2

This should also be considered true for the fungous type, since the Staph. albus which was found most frequently in this group is also found most frequently in the normal group. The Staph. albus and the diphtheroids cannot be treated with any significance because of their normal habitat in the normal external auditory canal. On the other hand, only 5.4% of the normal cultures revealed the B. pyocyaneus, as compared with 80% in the bacterial group and 30% in the fungous group. The other Gram-negative bacilli, the coliform group, were more prevalent in the fungous cases than in the bacterial.

An analysis of the fungi recovered (Table 4) reveals 20 (59%) of the 34 fungi cultured belong to the Aspergillus group. Of these the fumigatus and candidus

types were most frequently found. Eleven (32%) belonged to the yeast group, of which the Candida (Monilia), other than C. albicans, was most frequently found. In the bacterial group an equal number, eight, were in the Aspergillus and yeast groups. The Candida, of the yeasts, was most commonly found. The high incidence of fungi recovered in both the fungous (68%) and the bacterial (25.6%) group is of considerable significance, especially when these findings are compared with those of the normal control group, in which only 9.5% were found.

Three groups of otitis externa were studied mycobacteriologically to ascertain whether each presented a distinctive cultural picture. The first group was the acute diffuse edematous type, the second, the purulent exudate type, and the third, the chronic and recurrent group. The first two have already been described. The

TABLE 5.—*Incidence of Bacteria and Fungi in the Three Types of Otitis Externa*

Otitis Externa, Type	Patients, No.	Bacteria		Fungi with Bacteria	
		No.	%	No.	%
Acute diffuse edematous	38	27	71	11	29
Purulent exudate	42	30	71	12	29
Chronic and recurrent	40	20	50	20	50

TABLE 6.—*Incidence of the Types of Bacteria in the Three Types of Otitis Externa*

Otitis Externa, Type	Patients, No.	Bacteria, Type									
		B. Pyocyaneus, Cultures		Staph. Albus	Coliform	Proteus	Gram-Positive Aerobic Spore-Forming Bacilli	Diphtheroids	Nonhemolytic Streptococci	Staph. Aureus	Beta Hemolytic Streptococci
		Mixed	Pure								
Acute diffuse edematous	38	23	4	17	5	1	6	1	1	2	0
Purulent exudate	42	18	12	14	2	2	9	1	..	2	0
Chronic and recurrent	40	10	3	6	10	1	7	1	..	3	0

chronic and recurrent group included all those cases which were of at least three months' duration, had a tendency to acute exacerbations, and were more or less resistant to therapy. Many of these cases revealed a thickened discolored lining of the external canal, with various degrees of desquamation and exudate. Some were the chronic eczematoid type, with some weeping and vesicular involvement of the auricle. This group also included those cases which had the characteristics of the otomycosis type of infection. Of the 38 cases in the acute edematous type (Table 5), 11 (29%) had both fungi and bacteria, and 27 (71%) revealed only bacteria. Forty-two cases of the purulent exudate type had 12 (29%) with both fungi and bacteria and 30 (71%) with bacteria alone; the chronic and recurrent type had equal numbers of each, 20 (50%) in each group. A study of the bacteria in the three types (Table 6) reveals the B. pyocyaneus (Pseudomonas) by far the commonest in all groups. In the acute edematous type, 27 (71%) of the 38 cases revealed this Gram-negative bacillus, which was in pure culture in 4 of the cases. In the purulent exudate type, 30 (71%) of the 42 cases yielded this bacillus, which

was in pure culture in 12 of the cases; in the chronic recurrent group, 13 (30%) of 40 cases had this organism, which was in pure culture in 3 of the cases. The Staph. albus and the Gram-positive aerobic spore-forming bacilli were the next most frequently found organisms, except in the chronic group in which other Gram-negative bacilli, the coliform bacilli, were found in greater number. In a study of the fungi isolated (Table 7), it is noted that fungi were found in greater numbers in the chronic group, mainly in 50% of the specimens. In both the chronic and the purulent group, the yeast and yeast-like forms were almost as prevalent as the molds. The Candida, other than the albicans, was especially prominent in both these groups, being found as frequently as the Aspergillus. In the acute edematous group the molds were more common. In no instance were the fungi found in pure culture.

Mycobacteriologic studies of the three clinical groups revealed no specific bacterial picture for either group. In all instances the B. pyocyaneus was the most prevalent and frequently isolated organism, varying from 60% in the acute group

TABLE 7.—*Incidence of the Type of Fungi in the Three Types of Otitis Externa*

			Fungi, Type									
			Molds						Yeast and Yeast-Like Organisms			
Otitis Externa, Type	Patients, No.	Fungi, No.	Aspergillus	Penicillium	Hormodendrum	Mucor	Trichophyton	Scopulariopsis	Candida	Cryptococcus	Unidentified	Actinomyces (Saprophytic Variety)
Acute diffuse edematous	38	11	4	1	1	2	..	1	1	1	..	..
Purulent exudate	42	12	5	2*	..	..	..	..	4*	..	2	..
Chronic and recurrent	40	20	7	..	1	..	1	..	7	2	..	2

* Two fungi were isolated from the same culture.

to 43% in the purulent and 25% in the chronic group. This bacillus was found more frequently in pure culture in the purulent exudate type, namely, 40%. Other Gram-negative bacilli, the coliform group, were isolated more frequently in the chronic group than in the other two types. Fungi were found in the three types of otitis externa, especially in the chronic group, in which they were found in 50% of the cultures. The Aspergillus and the Candida were the commonest of the fungi; the Candida, commoner in the other two types of cases. These findings are similar to those of Senturia,[5] who reported, in an analysis of 82 acute cases of otitis externa, the Ps. bacillus (B. pyocyaneus) in 53.7% and Gram-negative bacilli in 29% of the cases. Fungi were found in 11% of this group, of which the aspergilli were more than half, 60%. In the chronic cases, the Pseudomonas and other Gram-negative bacilli were found somewhat less frequently, and the fungi were essentially the same.

In all my studies I found the B. pyocyaneus the most prevalent organism. In a total of 365 cultures taken from cases of otitis externa, the B. pyocyaneus was found in 186 (50%) of the specimens; Staph. albus, in 165 (45%); coliform bacilli, in 63 (20%); B. proteus, in 35 (9%); the diphtheroids, in 41 (11%), and Gram-positive spore-forming bacilli in 54 (15%) of the specimens. Streptococci were found very infrequently, the nonhemolytic in six (1.6%) and the beta hemolytic

in three (0.8%) of the cultures. If the bacteria found in the cultures of the normal ears in relatively the same proportions are eliminated, only the Gram-negative bacilli, namely, the pyocyaneus, the coliform, and the proteus, of which the pyocyaneus was the most prevalent, remain as significant etiologic factors. Similar findings have been reported by other observers. Syverton[6] reported the Pseudomonas in 66% of his cases; Simon,[13] in 50% of his cases, with the Gram-negative bacilli next in importance; Gill,[14] in 60% of his group. Beach and Hamilton,[15] reporting on a series of 69 cases from this same area, found the pyocyaneus bacillus in 94% of the group. Singer and his associates,[9] reporting on 405 cultures from cases of otitis externa, found the Pseudomonas bacillus in 65%; Staph. albus, 25%; Staph. aureus, 16%; Aerobacter aerogenes, 27%; Proteus, 8%; gamma streptococci, 7.6%; beta streptococci, 3.9%, and alpha streptococci, 3.4%. The Pseudomonas group is considered the most important etiological agent in otitis externa, with the Gram-negative bacilli and, possibly, the streptococci also having some etiological significance.

This investigation also revealed a relatively high incidence of fungi in the mycobacteriologic studies made. In 73 normal cultures, 7 (9.5%) were fungi, of which 3 belonged to the Aspergillus group, 1, the Penicillium, and 3, the yeast-like organisms. In 113 cases, clinically diagnosed as bacterial in 63 and fungous in 50, fifty cases (44%) revealed fungi. Finally, in the three clinical groups of cases totaling 120, forty-three cases (35%) revealed fungi. The method employed for culturing fungi was to carefully collect the material with a sterile loop and immediately plant it on a Sabouraud dextrose agar slant, pH 5.6 (Difco), and on a Löffler blood serum slant. The Sabouraud cultures were incubated at room temperature for a minimum of two weeks. Fungous growths on the Sabouraud slants were isolated in pure culture and inoculated to slide cultures, as described by Henrici.[16]

A high incidence of fungi was found in a culture study of 162 consecutive cases of otitis externa to determine the true incidence of bacterial and fungous infections. This group included 96 of the 120 cases recorded in Table 5 plus an additional 66 unclassified cases. Seventy-one (43%) cases of this group revealed fungi, and 91 (67%) revealed only bacteria. All the fungi were in association with other bacteria. The Aspergillus group was the most prevalent (60%), and the Candida, other than the albicans, was in 21% of the fungous cases. Out of a total of 365 cultures made of cases of otitis externa, 177 (48%) yielded fungi. Of these, 67% were the molds, 80% belonged to the Aspergillus group, and 32% were the yeasts, of which 63% belonged to the Candida group.

The large number of fungi found in all these studies is more than a coincidence, especially since only 9.5% of the control group revealed fungi. The Aspergillus group, of the molds, and the Candida, other than the albicans, of the yeasts, were the most prevalent. The questions which the fungi are pathogenic and under what

13. Simon, E.: Otitis Externa and Its Treatment, Arch. Otolaryng. **42**:123 (Aug.) 1945.

14. Gill, E. K.: Evaluation of Newer Drugs in the Treatment of Otitis Externa, Arch. Otolaryng. **52**:25 (July) 1950.

15. Beach, E. W., and Hamilton, L. L.: Tropical Otitis Externa: Ear Fungus, U. S. Naval M. Bull. **44**:599 (March) 1945.

16. Henrici, A. T.: Molds, Yeasts, and Actinomycetes: A Handbook for Students of Bacteriology, Ed. 2, New York, John Wiley & Sons, Inc., 1944.

conditions do they become so are still debatable ones. Wolf [10] names at least 53 different species of fungi as having been reported as causing otomycosis. Haley [7] reports some of these as well as others. Many other authors [17] report the Aspergillus group in this disease. Some of them also report the Candida, Penicillium, Hormodendrum, Mucor, Actinomyces, and other less important species. The incidence of fungous infections as well as the type of pathogenic fungi found in this condition may vary in different parts of the world. Whalen [18] stated that in China the predominant organism is the Aspergillus and in the Canal Zone the Candida is the most prevalent. Haley [7] studied the seasonal incidence of fungi isolated from the auditory canals of 305 patients and noted that the genera Aspergillus and Penicillium were isolated from October through May and that they appeared to predominate during January, February, and March. The Hormodendrum, Alternaria, and a species of Saccharomyces were more prevalent during fall and winter. All these reports, including my own, verify the fact that fungi are found in this disease and that they will vary in type and incidence, depending on the climate and location.

Since the B. pyocyaneus (Pseudomonas) is unquestionably the most important bacterial organism in all types of otitis externa and since fungi were found in a

TABLE 8.—*Bacillus Pyocyaneus and Fungi in Pure Culture, Mixed Culture, and in Combination with Other Organisms*

Specimens, Type	Specimens Examined, No.	B. Pyocyaneus	B. Pyocyaneus and Other Bacteria	B. Pyocyaneus and Fungi	B. Pyocyaneus, Fungi, and other Bacteria	Fungi	Fungi and Other Bacteria
Otitis externa	365	42	85	14	45	3	116
Normal	73	0	4	0	0	0	7

relatively large number of cases in this study, the relationship of these organisms to one another and to other bacteria is illustrated in Table 8. In the 365 specimens examined, the B. pyocyaneus was found in pure culture in 42 (11.5%) instances, with other bacteria in 85 (23%), with fungi alone in 14 (3%), and with fungi and other bacteria in 45 (12%) of the specimens. Fungi were found alone in only three (1%) of the cultures.

All these studies verify the work done by other observers. The Gram-negative B. pyocyaneus (Pseudomonas) is the predominant and most frequently isolated organism in otitis externa of all types and should be considered a primary etiologic agent in this disease. The other Gram-negative organisms, such as the coliform and Proteus bacilli, occur sufficiently more often than in the normal ear to be considered as playing some part in the etiology of this disease. The fungous studies show the incidence of fungi in a relatively large number of cases (48%). Although it is true that the fungi were always found associated with other bacteria, in only

17. (*a*) Salvin, S. B., and Lewis, M. L.: External Otitis, with Additional Studies on the Genus Pseudomonas, J. Bact. **51**:495 (April) 1946. (*b*) Pittenger, B. N.: Case Reports of Aural Aspergillosis, J. Kentucky M. A. **36**:161 (April) 1938. (*c*) Castellani, A.: Fungi and Fungous Diseases, Arch. Dermat. & Syph. **17**:61 (Jan.) 1928. (*d*) Alonso, M.: Otitis Externa in Puerto Rico: A Clinical and Bacteriological Study, Laryngoscope **61**:1114 (Nov.) 1951. (*e*) Senturia.[5] (*f*) Senturia.[12] (*g*) Simon.[13] (*h*) Beach and Hamilton.[15]

18. Whalen, E. J.: Fungous Infections of the External Ear, J. A. M. A. **111**:502 (Aug. 6) 1938.

59 (33%) of the 177 cultures were they found with the B. pyocyaneus, which is considered the important etiologic agent. In 65% of the cultures they were found with other bacteria. It is true that all fungi are not pathogenic; however, their presence in such numbers must be of some significance, and it is felt that they are at least a secondary etiologic factor in the cases studied here. Especially is this true in the chronic and recurrent group in which the fungi were found in 50% of the cases.

Unfortunately, no definite correlation can be made between the clinical types of otitis externa encountered here and the mycobacteriological flora. Although it was possible to diagnose 70% of the cases correctly as far as the bacterial and fungous types were concerned, it could only be accomplished with the classic cases. The specific types of otitis externa encountered in this area revealed no distinctive bacterial picture. All revealed similar organisms. The purulent exudate type had a larger number of pure cultures of pyocyaneus; the chronic and recurrent types revealed a larger percentage of fungi. These differences and other minor variations are not sufficient to give any of the types of otitis externa a distinctive bacterial pattern.

CONCLUSIONS

The Bacillus pyocyaneus (Pseudomonas aeruginosa) is the most prevalent and most important etiologic organism found in all types of otitis externa. The other Gram-negative organisms, such as the coliform group and the Proteus, should be considered as having some etiologic significance.

Fungi, namely, the Aspergillus and the Candida (Monilia), were cultured in a sufficiently large number of cases in this group to be considered as playing some part in the etiology of this disease.

No definite correlation could be made between specific types of otitis externa encountered in this study and mycobacteriologic findings.

Therapy should be considered in the light of the prevalent organisms found in this as well as other bacteriologic studies reported.

55 E. Washington St.

Dr. Henry Bauer assisted in the mycologic and bacteriologic studies.

EMBEDDED CALCIFIED FOREIGN BODY IN THORACIC ESOPHAGUS

Review of Atypical Cases and Report of a Case

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FOREIGN bodies in the air and food passages are relatively common, particularly in children, but their presence in adults can by no means be ignored. The removal of foreign bodies is certainly a challenge to every endoscopist because of the variety of objects swallowed or aspirated, the technical difficulties involved, and the complications which may occur. There is an abundance of literature on the subject, with the majority coming from the larger centers, with established bronchoscopic clinics or departments. Foreign bodies in the food passages constitute from 65 to 90% of the cases, while foreign bodies in the respiratory tract constitute the remainder. The purpose of this article is to review briefly some of the unusual cases reported on the removal of foreign bodies from the esophagus and to present an unusual case of my own.

Most of the foreign bodies which are swallowed pass the gullet without difficulty. If a foreign body sticks—most often it happens at one of the normoanatomically narrow parts of the esophagus—it very soon produces such serious complications that a patient with a foreign body impacted in the esophageal wall should be regarded as a candidate for surgical treatment. Foreign bodies have been reported to have been lodged in the esophagus for years without producing notable symptoms; these are purely exceptional cases. However, the majority of foreign bodies may be removed by endoscopy. Esophagotomy is rarely indicated.

Efskind [1] states that the therapeutical problems arising from the presence of foreign bodies in the thoracic part of the esophagus may be distributed into four points:

1. Perforation should be avoided since the resultant mediastinitis must be regarded as a serious complication, despite the advances of chemotherapy.

2. The actual technique used in the removal of the foreign body must be considered. There are only two procedures to choose from, endoscopy or operation. The most scrupulous care should be taken in the removal of foreign bodies which have remained in the esophagus for a long time and, especially, those which have sharp or irregular edges. The operative method to be considered is the transthoracic route, since a posterior mediastinotomy is inadequate; hence a thoracotomy is the operation of choice and should be carried out with the patient on the side giving the easiest access to the part of the esophagus where the foreign body lies. In case of perforation, the thoracotomy should be performed on the same side as the perfora-

1. Efskind, L.: Two Cases of Foreign Body (Tooth Plate) in the Thoracic Part of the Oesophagus with Perforation, Acta chir. scandinav. **99**:379-384, 1950.

tion. At present there is little or no excuse for resorting to a thoracotomy; however, as mentioned above, endoscopy should certainly not be attempted by the untrained or even by a skilled chest surgeon with only a superficial knowledge of endoscopy. Jackson and Jackson [2] state that 99% of foreign bodies in the lung can be bronchoscopically removed through the mouth and that the patient recovers in 98% of the cases. They also report that foreign bodies in the esophagus can be removed by esophagoscopy through the mouth in almost all cases; a single instance was the only exception in well over 1,500 cases.

3. Any infection following a transthoracic esophagotomy must be combated or, possibly, counteracted.

4. The occurrence of a postoperative stricture must be prevented.

Rashid [3] reports an interesting case, that of an infant, aged 5 months, with a button in the esophagus, who was able to drink milk but showed signs of marked dyspnea and was in great respiratory distress, requiring immediate tracheotomy. The infant was able to drink the milk because of the vertical position of the button. The milk could pass on either side of the button, but the button was pushing forward the anterior wall of the esophagus and the thin posterior wall of the trachea, thus causing the respiratory distress.

Since the advent of chemotherapy and antibiotics, perforation of the esophagus by no means always leads to formation of an abscess, and it is unusual to see suppurative mediastinitis following penetration by a foreign body. However, Korkis [4] reports three cases: A spinster, aged 52, swallowed a rabbit bone and complained of considerable dysphagia and putrid pus on coughing, with a large quantity of foul pus being expectorated at frequent intervals. A cervical mediastinotomy was done, with complete recovery. A woman, aged 63, had swallowed a chicken bone three days before examination. Esophagoscopy revealed that the bone was lodged transversely, but it was removed without too much difficulty. A cervical mediastinotomy was done, with complete recovery. A man, aged 49, swallowed a piece of bread and cheese which stuck in the lower part of his throat. Severe pain on swallowing followed. The pain became continually worse, and his physician tentatively diagnosed his condition as coronary thrombosis. On admission the following day, his temperature was 103 F. and there was evidence of surgical emphysema at the root of his neck on the right side. Mediastinitis from esophageal trauma was the diagnosis. Immediate esophagoscopy and cervical mediastinotomy were performed with the patient under general anesthesia. Although nothing was found except evidence of trauma, esophagoscopy revealed a traumatic lesion of the upper end of the esophagus on the right side, with marked edema. Liberation of considerable pus followed the right cervical mediastinotomy. The patient's convalescence was uninterrupted, and he was discharged as cured.

These cases have been reported since 1949 and prove that, in spite of all the advances in endoscopy and in the education of the general practitioners, no physician

2. Jackson, C., and Jackson, C. L., Editors: Diseases of the Nose, Throat, and Ear, Including Bronchoscopy and Esophagoscopy, Philadelphia, W. B. Saunders Company, 1945.

3. Rashid, A.: Atypical Case of Foreign Body in the Esophagus, Laryngoscope **60**:945-946 (Sept.) 1950.

4. Korkis, F. B.: Mediastinitis Following Foreign Body Perforation of the Cervical Oesophagus, Lancet **1**:4-8 (Jan. 5) 1952.

performing endoscopy is exempt from the possibility of encountering at any time a case of mediastinitis complicating a foreign body in the esophagus, however short a time the foreign body has been lodged there.

At first there was a reluctance to operate on any patient with mediastinitis, and as late as 1936 Lilienthal[5] wrote: "Doctors are afraid to have the mediastinum operated upon. The patient will die if not operated upon, and he cannot do worse if he is." An operation may be delayed too long in the hope that the antibiotics alone will cure the patient. Consequently, chemotherapy and antibiotics are the handmaidens of surgery in dealing with operative mediastinitis. They may be used to avert the need for surgery as well as in treatment after surgery. Perforation of the esophagus does not always lead to mediastinitis and may result in no more than a local cellulitis (nonsuppurative mediastinitis); in this instance the natural defenses of the body aided by the chemotherapeutic agents will usually suffice. The difficulty always lies in deciding whether suppuration or a full-grown mediastinitis is present or whether it is a local cellulitis. A review of the literature suggests that perforation of the esophagus with subsequent mediastinitis, unfortunately, follows instrumentation or endoscopy by the unskilled.

*Results of Esophagoscopy in 602 Patients**

Type	Foreign Body		
	Total	Removed, No.	Not Found or Not Removed, No.
Fish bone	157	64	47
Meat bone	151	102	29
Bolus of meat	35	33	1
Miscellaneous food	22	13	6
Denture	29	27	2
Halfpenny	48	44	4
Other coin	52	48	4
Safety pin	10	10	..
Pin, needle, or nail	10	5	5
Miscellaneous	54	31	17
Unknown foreign body	34	..	33

* The age of the patients ranged from 12 to 84 years.
The table is modified from Table III of Matheson.[6]

From July, 1936, to February, 1949, there were 602 cases of foreign bodies in the esophagus reported at the St. Giles' Hospital, Camberwell, England.[6]

The types of anesthetics employed in the group were inhalation anesthetics, 235; intravenously administered thiopental (Pentothal) sodium with or without local anesthetic, 179; local anesthetic, 205, and no anesthetic, 3. Thiopental without a local anesthetic was found unsatisfactory owing to spasm of the cricopharyngeal sphincter. The local anesthetic used for the first 400 cases was cocaine, 10%, and in the last 202 cases tetracaine hydrochloride (Amethocaine), 2%, was substituted for the cocaine. In 225 of the 602 cases, no foreign body was found by esophagoscopy since the esophagoscopies were performed on patients who insisted there was something impacted but could not suggest what it was; also many of the foreign bodies were not radiopaque.

5. Lilienthal, H.: Brief Résumé of Modern Thoracic Surgery, Mil. Surgeon **78**:58-62 (Jan.) 1936.

6. Matheson, I.: Foreign Bodies in the Oesophagus: A Review of 602 Cases, J. Laryng. & Otol. **63**:435-445 (Aug.) 1949.

Schaff and McCallen [7] report considerable success with a 5% solution of Caroid in the removal of impacted food from the esophagus. They employed 5% Caroid in small doses at frequent intervals. Usually 1 to 5 cc. can be given every 15 minutes without causing vomiting; however, larger quantities are preferred if they can be tolerated. According to their report, swallowing is often possible 45 to 90 minutes after the onset of Caroid treatment, even in cases of pronounced dysphagia and substernal distress.

Richardson [8] first reported the use of proteolytic ferment to relieve the distress of meat impaction in 1945, at which time he collected 17 cases, in 16 of which treatment was successful. He used a solution of papain. Caroid is a commercial preparation containing papain, a grayish-white powder prepared from the fruit of Carica papaya and containing a proteolytic enzyme that acts in acid and neutral media and converts proteins into amino acids.

Jackson and Jackson [9] have reported well over 3,000 cases of foreign bodies in both the air and food passages. After a careful review of the foreign bodies listed by them, I was able to find only one instance of a peach stone. In Case 1,057, that of an adult of 33 years, a peach stone had been lodged for two days in the esophagus below the cricopharyngeal fold and was removed by alligator rotation forceps in 13 minutes 39 seconds. There is no mention, however, of any encrustation or calcium deposits surrounding this or any other foreign body removed by them. Likewise, there is no mention by other authors of such deposits enveloping foreign bodies removed, however long their sojourn.

The physical signs of uncomplicated esophageal foreign bodies are inconstant. The suggestive symptoms and the reports of roentgenologic examination are the cardinal factors in the diagnosis. X-ray examination, unfortunately, gave little or no assistance in the case which follows.

REPORT OF A CASE

B. H., a white woman, aged 64, was seen in consultation by one of the general practitioners in this city on the day of her admission to the Peninsula General Hospital, July 18, 1949. She had been complaining for five days of a sore throat and inability to swallow. She was very toxic and dehydrated, since during this period she had had only small sips of water and had retained none. Antibiotics, mainly the sulfonamides, had been administered from the first day of her illness.

Family History.—Her mother and father had died of causes unknown. She had two brothers and one sister, all living and well.

Past History.—The patient recalled having swallowed a peach stone at the age of 6 years and stated that she had considerable difficulty in swallowing any food for several days thereafter. She also stated that at the age of 4 she was supposed to have drunk a small quantity of lye; at the time, consequently, her mother had attributed the child's trouble to the lye rather than to the peach stone. She recalled that the lump (or choking sensation) was in the upper part of the throat; however, this passed away, and no attention was paid until a year or more later, when she suffered an attack of choking and inability to retain food or fluids. She has had recurrent attacks, as many as three or four attacks within a year since the age of 6. During these attacks,

7. Schaff, B., and McCallen, A. M.: Esophageal Obstruction Due to Food Impaction Treated with Caroid Solution, Gastroenterology **15**:465-466 (July) 1950.

8. Richardson, J. R.: Loose Dentures as Esophageal Problems, Arch. Otolaryng. **47**:772-788 (June) 1948.

9. Jackson, C., and Jackson, C. L.: Diseases of the Air and Food Passages of Foreign-Body Origin, Philadelphia, W. B. Saunders Company, 1936.

she would become violently ill, be unable to take food or fluids, run a high temperature, which would last from 5 to 10 days, and would lose from 10 to 15 lb. (4.5 to 6.8 kg.). These attacks would subside, leaving the patient symptom-free until another such attack would occur without any apparent cause. She had sought consultation with some of the physicians in the community, as well as elsewhere, about the cause of these attacks. She had received fluoroscopic and x-ray examinations on several occasions, but no clue to the cause of the trouble had been offered and no diagnosis had been made. In spite of these recurrent illnesses, she was the mother of eight children, who were all grown and well.

Menstrual History.—The patient began to menstruate at about 12 years of age and recalls no trouble during the childbearing period. Cessation of menstruation was at the age of 49.

Physical Examination.—The patient was a dehydrated, toxic woman, weighing approximately 130 lb. (59.0 kg.); she had a blood pressure reading of 150/90; a pulse rate of 110, regular,

Fig. 1.—Obstruction at seventh or eighth dorsal vertebra.

without murmur, and a temperature of 98 F., which may be explained by the fact that antibiotics had been used for several days. Physical examination was negative so far as the nose and throat were concerned, except for a markedly inflamed, parched mouth, tongue, and pharynx—all were evidence that no fluids had been taken. Her tonsils were acutely inflamed and enlarged with a definite membrane within the crypts, or a typical follicular tonsillitis. There was some edema of the palate and uvula, and, so far as could be seen, the hypopharynx was acutely inflamed. A further examination was not made until the patient was admitted to the hospital, and since fluids were deemed much more important than further examination, intravenous medication was immediately instituted, within one hour after the patient was seen in consultation.

The patient was admitted to the Peninsula General Hospital on July 18, 1949, and the findings were essentially the same hours later. Intravenous medication and the antibiotics were continued,

as well as fluids by mouth, varying from 1 to 2 oz. (30 to 60 cc.), which were retained only from one to two hours. The focus of attention was primarily upon relieving the acute septic sore throat, or follicular tonsillitis. Cultures were not made as they did not seem important in view of previous antibiotic medication. On July 20, 1949, a fluoroscopic examination with films showed the esophagus outlined with a complete obstruction at the level of the seventh or eighth dorsal vertebra (Fig. 1). There was no obstruction above this location. The obstruction had the appearance of a possible malignant growth, but the area of obstruction was outlined sharply and could easily have been a polyp.

Operative Procedure.—Since dehydration in the patient had been markedly relieved by intravenous fluids and feeding and toxicity had been markedly reduced, an attempt was made to locate the cause of the obstruction. The pharynx and larynx had greatly improved by July 20, two days after her admission to the hospital, and on the following day she was posted for an esophagoscopy.

An esophagoscopy was performed on July 21, under local anesthesia, the patient receiving 2 grains (120 mg.) of phenobarbital sodium injection subcutaneously the night before and 2 grains (120 mg.) at 6:30 a. m., and $\frac{1}{6}$ grain (10 mg.) morphine injection and $\frac{1}{150}$ (0.4 mg.)

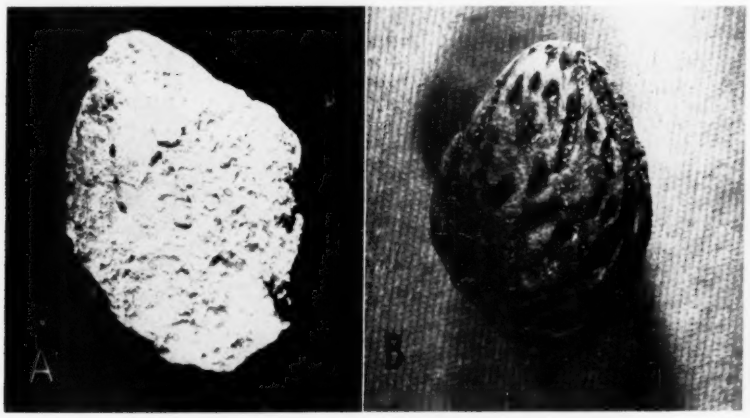

Fig. 2.—*A*, calcified foreign body removed; *B*, peach stone with calcification removed.

of atropine at 7:30 a. m. The throat was carefully sprayed with 2% tetracaine hydrochloride (Pontocaine) with epinephrine added. Indirect laryngoscopy was negative; direct laryngoscopy was negative. A 7 by 45 mm. esophagoscope was passed. There was no inflammation, irritation, or obstruction noted in the upper esophagus; however, after about the lower half had been reached and considerable progress had been made in the lower fourth, there was marked edema and inflammation, with the esophagus becoming obliterated in this area. It was here that a foreign body was seen. On further examination, it appeared to be a hard, encrusted embedded mass, located in the right posterior portion of the esophageal wall, approximately 5 or 6 cm. above the cardiac end. This mass had the texture and appearance of an oyster shell. The 7 by 45 mm. esophagoscope was withdrawn, and a 9 by 45 mm. esophagoscope was introduced; the same foreign body was located, and with gentle manipulation from its contact edges the upper portion of the foreign body was released from its adjacent mucous membrane by use of an anterior biting alligator forceps. A lumen finder was the gently introduced between the foreign body and the mucous membrane of the esophageal wall and traced downward until it was believed that the entire foreign body had been released. With anterior grasping forceps, the foreign body was grasped, and on two occasions it was unsuccessfully withdrawn; the forceps were reintroduced and it was finally removed trailing the 9 mm. esophagoscope (Fig. 2*A*). Little or no bleeding was encountered; however, reintroduction of the 7 mm. esophagoscope was made and 5% silver nitrate was applied to the ulcerated area. The foreign body was a markedly irregular, rough encrusted mass resembling an oyster shell, and in further examination it proved to be a calcified mass approximately 1½ in. (3.81 cm.) in length, 1 in. (2.54 cm.) wide, and ¾ in. (1.91

cm.) thick The outer coating, or calcified mass, was cracked with a Kelly's forceps and found to be only a shell 0.25 to 0.5 cm. in thickness completely enveloping a peach stone (Fig. 2*B*). The peach stone showed no evidence of decomposition and presented practically the same irregularities and shape as a stone from a ripe peach.

No attempts were made to do a chemical analysis of this outer coating, nor can any explanation be given to why a peach stone or any foreign body, despite the length of sojourn in the esophagus, would accumulate such deposits.

After withdrawal of the esophagoscope, the patient was given a glass of sterile water—the first fluid taken by mouth and retained in approximately 10 days. Sterile water was continued

Fig. 3.—Roentgenogram with barium following esophagoscopy and removal of foreign body.

for the next 12 hours with the thought in mind that a mediastinitis might ensue. An x-ray with barium immediately after the esophagoscopy showed no evidence of obstruction (Fig. 3). Fortunately, no complaints or complications followed. In 48 hours the patient was drinking copiously and eating a soft diet. She was discharged from the hospital three days later, and since that time she has experienced no discomfort.

SUMMARY

A review of atypical cases of foreign bodies in the esophagus was presented. The dangers of a foreign body lodged in the esophagus and of a resultant perforation with mediastinitis were stressed. The relative frequency of various foreign bodies in the esophagus was presented in tabular form. A report of an unusual case was submitted.

HISTORICAL COMMENTS ON THE HUMAN VESTIBULAR APPARATUS

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RECENTLY I came across the old but very well-known textbook on otology by L. Jacobson and L. Blau.[1] At the time the book was written both men, especially Jacobson, were famous otologists. The book itself is outstanding because of its thoroughness and completeness in citing older as well as contemporary authors.

Automatically I turned to the index to find the heading "Vestibular Apparatus," only to find that this heading was missing. I then realized that such a heading at the time of the edition, 1902, could not be found in an otological textbook. The first mention of the vestibular apparatus is to be found in a book written by Bárány [2] in 1907. With this publication and, especially, the famous monograph of Bárány and Wittmaack [3] in 1911, the vestibular apparatus was first included as a term in the field of otology.

However, the beginning of the doctrine of the vestibular apparatus is much earlier. If Purkinje's classic experiments on sensation of rotation, in 1820, are disregarded, Ménière can be credited as the first, in 1861, to prove in an exact manner the causal connection between the disease named after him and pathological changes of the semicircular canals. Flourens' previous experiments on animals, in 1842, apparently stimulated Ménière in drawing his conclusions.

Later there appeared a number of anatomical and physiological papers written by: Cyon in 1876; von Stein in 1894, and Stern in 1894. There also appeared publications based on physiopathological experiments: Breuer in 1889; Kreidl in 1892; Urbantschitsch in 1892, and others. All of them contained important data but lacked a common denominator until the publication of Bárány's discoveries.

The study of otology originated in Europe, as did the vestibular doctrine. In the beginning, French authors (Flourens, Ménière, Cyon, and others) did the most writing about the vestibular apparatus. Later the research work of such authors as Breuer, Kreidl, Ewald, Urbantschitsch and, finally, Bárány shifted the interest to Central Europe, especially, Vienna. Bárány established in this town a well-known vestibular center in collaboration with such famous scientists as Neumann, Alexander, Ruttin, Leidler, and others. When Bárány went to Sweden, a similar center for vestibular research was established there. From these centers the new doctrine has been spread throughout the world.

1. Jacobson, L., and Blau, L.: Lehrbuch der Ohrenheilkunde für Aerzte und Studirende, Ed. 3, Leipzig, G. Thieme, 1902.

2. Bárány, R.: Physiologie und Pathologie (Funktions-Prüfung) des Bogengang-Apparates beim Menschen, Leipzig, F. Deuticke, 1907.

3. Bárány, R., and Wittmaack, K.: Funktionelle Prüfung des vestibular Apparate, Jena, G. Fischer, 1911.

Occupied with these thoughts, I opened the textbook of Jacobson and Blau to learn how the authors dealt with these problems 50 years ago. I was surprised to find an abundance of observations, facts, and theories which partly anticipated the later development of the vestibular doctrine. Because all of this is more or less unknown to the younger generation of otologists, I have attempted to review some of the earlier observations.

In chapters on vertigo, disturbances of equilibrium, and Ménière's disease, I found many facts and observations which are connected with what is now known as the vestibular apparatus. The description of these phenomena is excellent and does not differ essentially from similar descriptions in recent textbooks. Jacobson and Blau stress the fact that vertigo may appear spontaneously or be caused by special procedures. One of the procedures is syringing the auditory meatus with water, especially "when the water is not warm enough or the syringing is made with too great a pressure."[4] Most of the other authors believe, however, that the temperature rather than the pressure of the water is more important in causing vertigo, thus coming nearer to the modern conception.

Jacobson and Blau also pointed out that it is easier to produce vertigo while "syringing with cold rather than with warm water."[5] Many authors, Jacobson stated, believe that the irritation of the sensory nerves of the external and middle ear may be responsible for producing the vertigo. In Jacobson's opinion this is not true because he believes that vertigo is caused by a change in the blood circulation of the labyrinth vessels. While Jacobson and Blau are very exact in the description of the phenomena produced by syringing, they are less so in the explanation of the causation. In their opinion, the following factors are responsible: (1) pathological changes of the central nervous system; (2) diseases of the eighth nerve, including the entire labyrinth, and, (3) disease or artificial irritation of the external or middle ear. All these may lead to disturbances of the equilibrium either by changing pressure and blood circulation of the labyrinth or by influencing, directly or indirectly, the brain. This confused wording shows clearly that at that time the authors still lacked the knowledge and understanding of the vestibular apparatus.

Urbantschitsch,[6] one of the most famous otologists of his time, stressed that the temperature of water for syringing should be the same as the temperature of the blood, 37 to 39 C. (98.6 to 102.2 F.), because colder or warmer water may cause giddiness, heaviness of the head, and, sometimes, nausea and vomiting. Lucae, another famous German otologist, recommended using a syringe with a closed rubber top and many openings only on the sides in order to avoid direct jets of water on the tympanic membrane. Walb[7] advised patients sensitive to syringing to close their eyes. No wonder that in this manner even the best observer would and did miss the appearance of nystagmus during syringing!

Whereas the appearance of vertigo and nausea after syringing the ear with water has been described rather exactly by early otologists, it is remarkable that none of the many acute observers noticed the nystagmus after syringing, not to mention the vestibular tonic reflexes of the body and its extremities. These reflexes

4. Jacobson and Blau,[1] p. 97.

5. Jacobson and Blau,[1] p. 99.

6. Schwartze, H., Editor: Handbuch der Ohrenheilkunde, Leipzig, F. C. W. Vogel, 1892-1893, Chap. 11.

7. Walb, in Schwartze.[6]

were, perhaps, observed but were regarded as part of the disturbances of the equilibrium resulting from syringing the ear. But why has not the vestibular caloric nystagmus been described? Perhaps it was because of the obvious difficulty for the physician to observe the nystagmus. He syringed the ear in cases of cerumen or purulent otitis and stood at the patient's side, his attention focused on the ear and not the eyes of the patient.

However, the situation was different when the physician rotated the patient. Rotation was performed mostly for scientific reasons; the physician sat opposite the patient and could well observe him after the rotation. So the rotatory nystagmus did not escape the attention of the former observers. The normal person when rotated showed vertigo and "jerking movements of the eyes" in nearly every instance, whereas in deaf mutes these symptoms were missing when their semicircular canals were "diseased" (Kriedl [8]). Today one would say that the nystagmus was lacking in patients with an unexcitable vestibular apparatus. These observations have been confirmed by other authors.[9]

This short and by no means complete review proves clearly that in spite of so many exact and valuable observations on the vestibular reactions, it was not recognized for a rather long time that all the phenomena are caused by a common mechanism. Bárány was the first to express clearly the opinion that the symptoms arising after syringing the ear with water or after rotating the patient are but different kinds of stimulation of the same organ. Many of the authors saw these different reactions but failed to recognize the common base—the vestibular apparatus.

Completely new fundamental discoveries are extremely rare in medicine as well as in other sciences. There are nearly always previously scattered observations the intrinsic connection of which is unknown. With the recognition of the organic connection between these observations, a real step forward will be gained toward further scientific discovery.

8. Kreidl, in Jacobson and Blau.[1]

9. James, Mygind, and Bezold, in Jacobson and Blau.[1]

Case Reports

FOREIGN BODY IN A BRONCHUS

Report of a Case in Which a Straight Pin Produced Unusual Signs and Symptoms

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AND
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PHYSICAL and roentgenoscopic signs and clinical symptoms of a foreign body in the tracheobronchial tree depend chiefly on the size and shape of the substance that has been aspirated and the degree and duration of bronchial obstruction.

Aspiration of a straight pin into the bronchial tree may be associated with an initial period of irritation characterized by coughing and strangulation; but symptoms subside promptly, and the foreign body may remain in the lung indefinitely without causing further distress. The absence of signs and symptoms in such a patient is readily explained, because the head of a pin is not large enough to cause obstruction to the exchange of air in the peripheral area of the lung.

The following case is reported because of significant pulmonary signs and symptoms following aspiration of a straight pin and the interesting reason for the unusual findings.

REPORT OF A CASE

The patient, a white boy, 13 years old, was blowing pins through a "bean shooter" on March 2, 1953, when one of the pins was aspirated into his right lung. He experienced the usual amount of coughing associated with this episode, but respiratory symptoms continued and were accompanied by fever and generalized muscular soreness. On March 7, 1953, an x-ray of the thorax revealed an ordinary pin in a bronchus to the lower lobe of the right lung and a triangular area of infiltration, the apex of which was located near the point of the pin (Fig. 1).

Physical examination revealed marked decrease in breath sounds over the lower lobe of the right lung posterolaterally. The temperature reached 103 F., and coughing was frequent and nonproductive.

More detailed questioning of the patient elicited the information that the pins that were being blown through the "bean shooter" had been stuck through pussy willow buds. This fact was confirmed when the foreign body removed at bronchoscopy under intravenous anesthesia on March 10, 1953, was found to have the bud at the point of the pin (Fig. 2). Another x-ray taken three hours after removal showed marked clearing of the area of pulmonary atelectasis. The patient seemed normal the following day and was permitted to return home.

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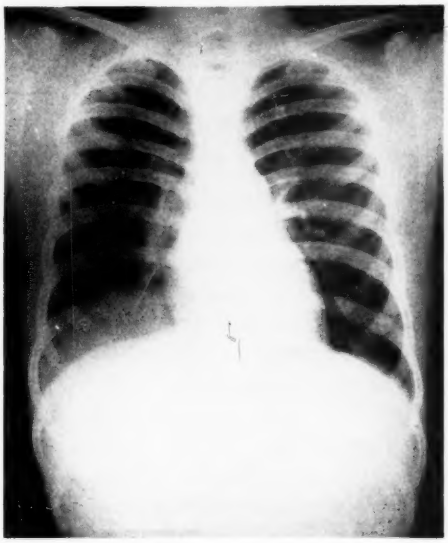

Fig. 1.—Thorax with a straight pin in a bronchus to the lower lobe of the right lung.

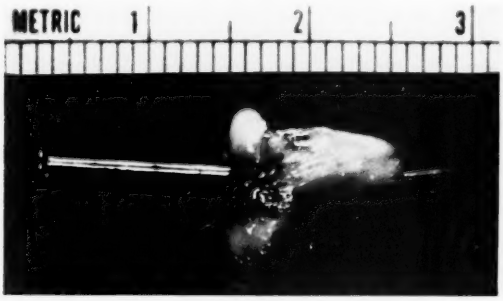

Fig. 2.—Pussy willow bud at point of pin.

CASE OF NONCHROMAFFIN PARAGANGLIOMA

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THESE interesting tumors, which presumably arise from the adventitia of the jugular bulb in the floor of the mastoid antrum and also possibly from other paraganglionic cells that occur in the middle ear, went unrecognized until 1945, when Rosenwasser, of New York, described the first case. Since then, further cases have been described from time to time, but they are still by no means common. In the classical review by Lattes and Waltner, in *Cancer*, May, 1949, in which eight more cases were reported, it was suggested that the original descriptions as carotid body-like tumor and glomus jugulare tumor be jettisoned in favor of the more correct name of nonchromaffin paraganglioma.

The case reported below, which presented certain quite characteristic features, is the first known to have occurred at St. Luke's Hospital in New York.

REPORT OF CASE

The patient was a Negro woman, aged 46, in apparently good health and of good physique and intelligence, who first came to our clinic on Feb. 12, 1952, with a history of a discharge from the left ear, which she said she had had for about a year. Four years previously she had had a similar condition. On examination she was at first thought to have a pedunculated polyp in the left external auditory meatus; the "polyp" was snared off, and she bled rather freely. The bleeding, in fact, was so free that she was hospitalized for two days. Meanwhile, the "polyp" was submitted to the Department of Pathology, where it was reported as a glomus tumor of the skin of the ear. X-ray films showed some cloudiness of the left mastoid antrum.

She was admitted for a radical mastoidectomy and was operated upon on March 25. At operation a gelatinous fibrinous material was found within 2 or 3 mm. of the bony surface. This same material completely filled the antrum and the aditus and above had eroded the dural wall. In front it had broken down the wall of the external auditory meatus and, filling the latter, had been responsible for the original appearance of an aural polyp. Bleeding from all parts was profuse, so much so that it became very difficult to work in the deeper parts, until finally the bleeding had to be staunched by means of packing the cavity with iodoform gauze. The hemorrhage, in fact, had been so severe that it was deemed advisable to transfuse 500 cc. of blood.

Postoperatively the patient made a good recovery and was discharged on April 11, 1953. Meanwhile, however, the Department of Pathology had identified and reported a specimen of tissue submitted as a nonchromaffin paraganglioma.

In view of the implications of this diagnosis, it was decided to have the patient back for a revision mastoidectomy. She was accordingly readmitted on April 20, 1953, and the operation was done the following day. On this occasion the cavity was cleaned of granulation tissue, and

Resident in Otolaryngology, St. Luke's Hospital.

the mastoid cells were then curetted in all directions until healthy bone was exposed. Hemorrhage was within the limits of a normal mastoidectomy, in marked contrast to the profuse hemorrhage at the original operation.

Postoperative recovery again was smooth and uneventful, and a clean cavity resulted. In view of the fact, though, that local recurrences are common and that distant metastases also occur at times, the patient was given a moderately intensive course of deep x-ray therapy, namely, a total of 15 treatments during the period May 6 to 26. She has been seen in the clinic since, the last time on June 16, when it was found that the cavity was healing well with very little drainage and pain. She is to be followed up in the usual way.

Permission to report this case was given by Dr. Victor C. McCuaig, Chief of Service of the Department of Otolaryngology at St. Luke's Hospital. It was the subject of a case presentation at a Residents' Meeting at the Academy of Medicine in New York in May, 1953.

SOLITARY NEUROFIBROMA PRESENTING IN PHARYNX AND NECK WITH HORNER'S SYNDROME

E. L. MANNING, M.D.
DAVENPORT, IOWA

PATIENTS showing a mass which presents itself in the neck and in the pharynx on the same side are seen relatively frequently by the otolaryngologist. Case reports of these in which the tumors are related to the neurofibromas usually stress the infrequency of the lesion in this location.

In the strict sense a neurofibroma is a tumor which shows all the elements of the nerve trunk (perineurium, endoneurium, connective tissue, axones, and sheath cells). Neurilemmoma arise from sheath cells only. However, the term neurofibroma is used very loosely and a large number of the tumors called neurofibromas are really neurilemmomas.

Figi [1] in 1933 mentioned that New and Childrey had reviewed 63 cases of benign tumor of the pharynx and tonsil from the Mayo Clinic between 1917 and 1930 and did not find a case of neurofibroma primary in this region but found several from the neck that enlarged into the oral or pharyngeal cavity. Figi stated that the tumors arise from the sheaths of nerves or from nerve roots. They are more commonly situated centrally, that is, on nerve roots, in contradistinction to the tumors of neurofibromatosis (von Recklinghausen's disease), which are as a rule found peripherally. They do not metastasize and are classified as benign tumors.

Figi presented a case of a 61-year-old woman who had an extremely prominent left tonsil bulging into the midline of the pharynx, with a mass in the left upper cervical region. The tonsil was removed and showed chronic inflammation. Four weeks later, after preliminary external carotid artery ligation, an encapsulated growth 4.5 by 6 by 8 cm. was removed and was found to be a neurofibroma. Figi reviewed the literature (up to 1933) and did not find another case of solitary neurofibroma similar to the one he presented.

The case to be presented is practically identical to his except that the patient was a young man and showed Horner's syndrome on the affected side.

Hall and Owens [2] in 1941 presented a case in which the tonsil was pushed medially by a mass which on biopsy was found to be a neurofibroma.

College in 1939 reported a case of a 27-year-old woman who had a swelling in the right upper neck for two or three years, with the right tonsil enlarged. One month after a tonsillectomy was done a solid tumor was exposed in the neck. It was bluish in color and was lying behind and internal to the carotid sheath. Postoperatively the patient had Horner's syndrome on the right side, which persisted. The tumor was a neurofibroma and was believed to be from the cervical sympathetic.

1. Figi, F. A.: Solitary Neurofibroma of Pharynx, Arch. Otolaryng. **17**:386 (March) 1953.

2. Hall, C. and Owens, H.: Solitary Neurofibroma of Pharynx, Arch. Otolaryng. **34**:1163 (Dec.) 1941.

3. Footnote deleted.

Motley [4] in 1941 reported a 21-year-old patient with a benign neurofibroma behind the left posterior pillar, reaching from the lower pole of the tonsillar fossa to the pyriform sinus. This was removed through the mouth. Symptoms had been present for four years.

Hanley and Davol [5] in 1952 reported a pharyngeal neurilemmoma which they believed arose from the cervical sympathetic chain, because of the presence of Horner's syndrome.

REPORT OF A CASE

P. B., a 25-year-old man, noted a swelling of the right side of the neck after a sore throat in July 1948, with increased swelling after a cold in September 1948. On examination in January 1949 the right tonsil and pharyngeal wall appeared pushed forward about 1.5 cm. and the neck showed a smooth moderately firm flat swelling, about 8 to 9 cm. in diameter, on the right side below the angle of the jaw. The right pupil was narrower than the left, and the lid space was narrower on the right than on the left.

Tonsillectomy was done on Dec. 1, 1948, and a biopsy was taken of the mass behind the fossa. The biopsy report was "normal tonsillar fossa." On Dec. 14 another biopsy showed chronically inflamed muscle and tonsil bed. On Jan. 10, 1949, a portion of the pharyngeal mass was removed and frozen section made. This showed mucous glands, and the pathologist felt that the portion was sufficient for biopsy; consequently no further material was taken. The final report on this was "oral mucosa, submucosa, and submucosal mucous gland; chronic inflammation." On Jan. 20, 1949, the area of the swelling on the right side of the neck was explored and no abnormal tissue was found. Biopsies taken at that time showed normal submaxillary and parotid glands and normal fibrous tissue.

The diagnosis was left as "chronic inflammatory swelling right side of pharynx with cervical adenitis and Horner's syndrome" although it was thought that the actual diagnosis must be of some type of tumor. It was believed that this case must be followed up.

On communicating with the patient in 1953, I was referred to Dr. H. M. Klinger, at the Geisinger Memorial Hospital in Danville, Pa. Dr. Klinger stated that on May 7, 1952, the patient was admitted because of a large mass on the right side of the neck (three years since last seen by me). On May 9, 1952, an encapsulated mass was shelled out without too much difficulty by blunt dissection. Microscopic examination showed a benign neurofibroma. No evidence of recurrence was seen on Dec. 8, 1952.

SUMMARY

A case of solitary neurofibroma bulging into the pharynx and neck, with Horner's syndrome, is reported. Five other cases from the literature are reviewed.

1820 W. 3rd. St.

4. Motley, F. E.: Position Malignancy, Arch. Otolaryng. **34**:771 (Oct.) 1941.

5. Hanley, J. S., and Davol, R. T.: Pharyngeal Neurilemmoma: Report of One Case with Removal by Intraoral Approach, Arch. Otolaryng. **56**:207 (Aug.) 1952.

BRONCHIAL DILATORS AND FILIFORMS

ERNEST B. EMERSON Jr., M.D.
ROCHESTER, N. Y.

The increasing use by thoracic surgeons of segmental pulmonary resection has made accurate bronchoscopic investigation and suitable quantitative reporting of the findings an absolute necessity. Linear measurements within the tracheobronchial tree were made possible by the bronchial yardstick,[1] and luminal measurements within the main bronchi may be satisfactorily obtained with the intrabronchial caliper.[2] The intrabronchial dilators and filiforms presented herein are designed to make further investigation and recording of conditions beyond the main bronchi possible and, in addition, to make possible certain instrumental procedures, such as bronchial dilatation and bronchial rotation.

INSTRUMENTS

The illustrations are largely self-explanatory. The dilators are of stainless steel and come in sizes from 10 through 26 F. The larger dilating heads are flattened on two sides, thus eliminating disruption of air exchange in the larger bronchi during instrumentation. The heads may be attached to either of two handles, one rigid and the other flexible, for upper lobe work (Fig. 1).

The filiforms are actually adaptations of urethral filiforms and are radio-opaque, with the ends rounded to minimize the risk of bronchial perforation. They are presented here because they are designed to be attached to the handles of the bronchial dilators (Fig. 2).

TECHNIQUE

The methods of use and the problems to which these instruments may be applied should be obvious to the trained bronchoscopist. It is important, however, to point out that all this equipment is radio-opaque and that its use under fluoroscopy considerably extends the possibilities of bronchial exploration. The filiforms and small dilators may be used under the fluoroscope without use of the bronchoscope, having been inserted by catheter gun (Fig. 3).[3]

CONCLUSION

Intrabronchial dilators and filiforms have been presented.[4]

They have been found satisfactory for the purpose for which they were designed, i. e., quantitative reporting of intrabronchial investigation and instrumentation in certain cases of bronchial stenosis and postoperative complications.

From the Department of Surgery, Division of Otolaryngology, University of Rochester School of Medicine and Dentistry, in conjunction with the Bronchoscopic Service of the Batavia Veterans Hospital, Batavia, N. Y.

1. Emerson, E. B., Jr.: A Bronchial Yardstick, J. Thoracic Surg. **21**:516-518 (May) 1951.

2. Emerson, E. B., Jr.: Intrabronchial Caliper, A. M. A Arch Otolaryng **55**:724-725 (June) 1952.

3. Emerson, E. B., Jr.: Endotracheal Catheter Gun, A. M. R. Arch. Surg. **64**:250-252 (Feb.) 1952.

4. The bronchial dilators and filiforms are available to members of the medical profession through C. R. Bard, Inc., 490 Morris Ave., Summit, N. J.

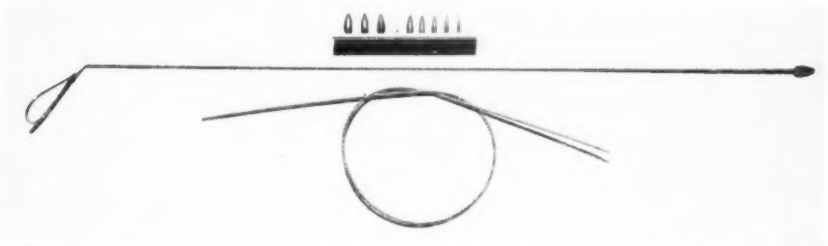


Fig. 1.—Bronchial dilators, with both rigid and flexible handle. Notice that the four largest dilators are flattened on two sides.

Fig. 2.—Bronchial filiforms. The ends have been rounded.

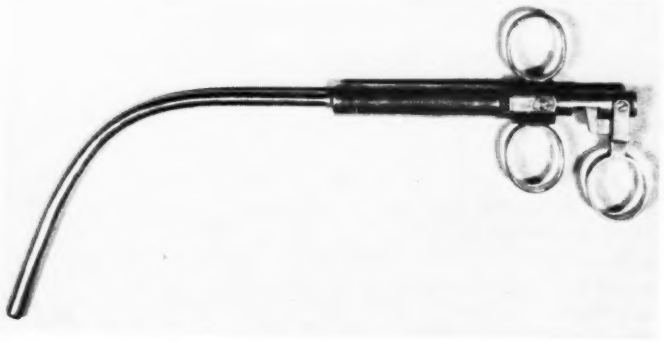
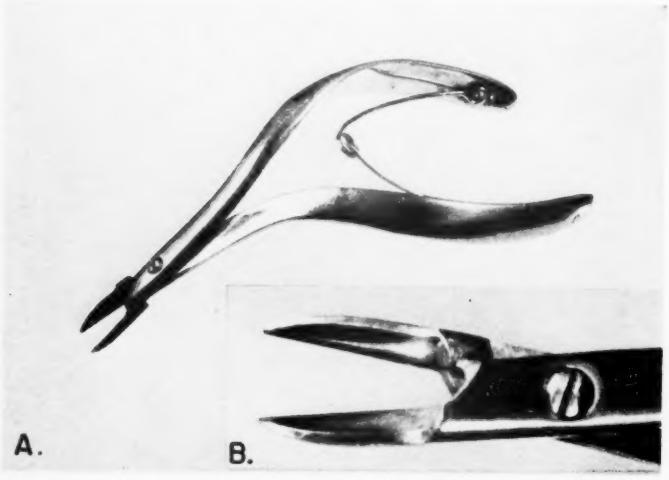


Fig. 3.—Endotracheal catheter gun.

ANGULAR BONE-CUTTING FORCEPS FOR RHINOPLASTY

IRVING B. GOLDMAN, M.D.
NEW YORK

In rhinoplasty after the bony hump has been removed, the nasal processes of the maxillae are displaced mesially to obliterate the gap between the nasal bones. The surgeon not infrequently finds on approximation that the nasal bones are asymmetric or that they project beyond the planned profile line, producing a new hump. Attempts to rasp or saw this projecting bone on an



A, angular bone-cutting forceps. *B*, magnification of biting jaw; note contour of cutting blades.

unstable pyramid not only are difficult but also are fraught with danger. Scissors are not easily maneuvered, nor have they the required power to remove accurately the desired fragment of bone.

Using the principle of the Kazanjian forceps, I devised a bone-cutting forceps with nipper-type cutting blades for removal of fragments of nasal bones under direct vision or for the removal of any desired part of the bony vault.

The instrument has a bent handle, permitting a clear and direct view of the field of operation. An unobstructed view is made possible by the fact that both cutting blades are in a slanted position toward the cutting edge.

121 E. 60th St.

The instrument is manufactured by A. Klenk Instrument Co., Maspeth, N. Y.

From the Division of Rhinoplasty, Department of Otolaryngology, Mount Sinai Hospital.

Presented as a New Instrument at the Fifty-Seventh Annual Session of the American Academy of Ophthalmology and Otolaryngology, Chicago, October, 1952.

SIMPLIFIED METHOD OF EXTRACTING AN UNUSUALLY SHAPED BONE FROM THE ESOPHAGUS

Report of a Case

HERBERT H. HARRIS, M.D.
HOUSTON, TEXAS

It is not frequent that the occasion arises when a bone in the esophagus cannot be removed by the usual methods which have been described in various textbooks and treatises on the subject. I was prompted to report this case because I felt that it offered a certain new method or concept of removing certain types of thin, stellate-shaped bones from the esophagus. It is true that this may occur infrequently when the average broncho-esophagologist may have such a peculiarly or unusually shaped foreign body to remove. A review of the literature does not reveal this method, which will be described in detail as a case report.

Matheson,[1] in reviewing over 600 cases, did not mention any unusual problems in removing bones. Jackson and Jackson,[2] in reviewing over 3,000 cases of all types of foreign bodies, did not mention any unusual procedure carried out in removing bones. Norris,[3] in reviewing 250 cases, did not mention any great problem encountered with bones. Boyd,[4] in reviewing 400 cases of foreign bodies in children, mentioned no unusual procedure. Suehs[5] also reported a series of 85 cases of foreign bodies in the food and air passages without reference to any great difficulty in removals. Meyers[6] reported the use of cotton in the nonsurgical removal of nonopaque foreign bodies from the esophagus. In a series of 60 cases of bone in the esophagus I did not encounter any other cases which required special instrumentarium or a procedure other than that which is ordinarily required of an esophagologist.

The patient, Mrs. H. B., a 40-year-old woman, suffering with considerable dysphagia and pain in the suprasternal notch because of a bone she had swallowed the day before, was admitted to the hospital. On the previous day she had been examined with an esophagoscope, but the bone was not found, even though the x-rays showed its presence. A subsequent x-ray (Fig. 1), taken at the time of her admission, showed the bone to be in approximately the same location in which it was observed on the previous x-ray. The patient was in fairly good health, except that she had difficulty in hearing, which had been rather severe for a number of years. She also had some stomach trouble which had never been completely diagnosed or completely relieved by symptomatic treatment.

On the day of her admission she was taken to the operating room after she had been given the usual premedication of morphine sulfate, ¼ grain (15 mg.), and scopolamine hydrobromide, 1/200 grain (0.3 mg.). The pharynx and larynx were sprayed with 2% pontocaine hydrochloride. A No. 9 mm. by 45 cm. esophagoscope was passed with extreme ease over the dorsum

From the Department of Otolaryngology, Baylor University College of Medicine.

Read before the Section of Ophthalmology and Otolaryngology of the Houston Academy of Medicine, Houston, Texas, March 20, 1952.

1. Matheson, I.: Foreign Bodies in the Esophagus: A Review of 602 Cases, J. Laryng. & Oto. **63**:435-445, 1949.

2. Jackson, C., and Jackson, C. L.: Diseases of the Air and Food Passages of Foreign-Body Origin, Philadelphia, W. B. Saunders Company, Ltd., 1936, pp. 1-636.

3. Norris, C. M.: Foreign Bodies in the Air and Food Passages: A Series of 250 Cases, Ann. Otol. Rhin. & Laryng. **57**:1049-1071, 1948.

4. Boyd, G.: Esophageal Foreign Bodies, Canad. M. A. J. **64**:102-107, 1951.

5. Suehs, O. W.: Foreign Bodies in Air and Food Passages: Observation on a Series of 85 Cases, Texas J. Med. **46**:298-303, 1950.

6. Meyers, E. L.: Non-Surgical Removal of Non-Opaque Foreign Bodies in the Esophagus, Eye, Ear, Nose & Throat Month. **27**:513-516, 1948.

Fig. 1.—Esophagus with the foreign body located directly below the level of the cricoid cartilage.

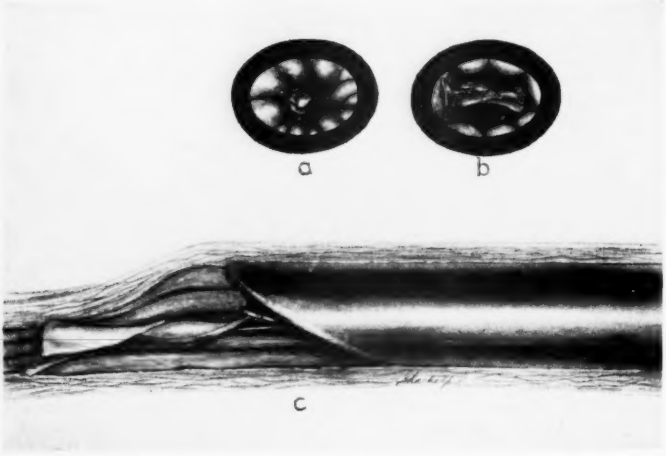


Fig. 2.—*a*, the proximal point of the three points of the bone; *b*, the three points as visualized by the operator; *c*, the bone as it is being grasped by the forceps.

Fig. 3.—Reconstructed bone.

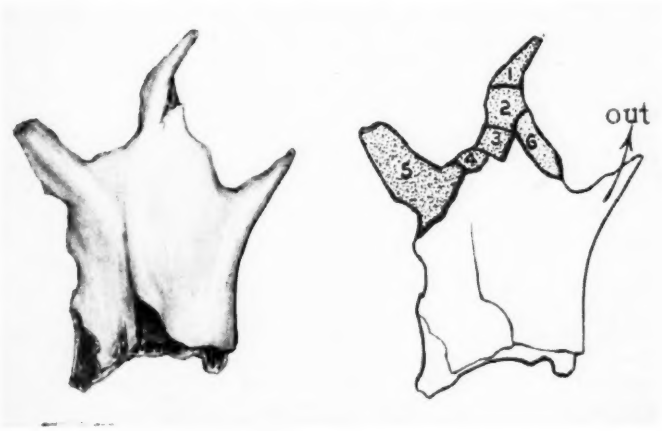


Fig. 4.—Numbers represent the steps taken in breaking the small pieces of bone with tissue forceps.

of the tongue, through the cricopharyngeus, and down into the thoracic esophagus. As the esophagoscope passed the cricopharyngeus and the suprasternal notch region, particular care was given to locate the bone which was known to be present. This was done on two or three occasions, but the bone could not be loosened from the folds of the tissue which were overlying it.

In order to make the patient completely relaxed, she was placed under general anesthesia with an intratracheal tube in place. Again the cricopharyngeal area was exposed with an esophageal speculum, which at this time revealed the bone lying transversely, just below the cricopharyngeus. The exact size of the bone was not known until this examination. At this time the three points illustrated in Figure *2b* were seen. Figure 3 shows an actual photograph of the reconstructed bone. Several attempts were made to remove the bone by using the side-curve forceps and the right-angle rotation forceps. The bone could not be rotated or sheathed in the scope in any manner, nor was it possible to release the holds of these sharp points on the esophagus.

A larger scope, having a diameter of 10 to 14 mm. and an oval lumen, was then employed. This gave a much broader field, and several attempts were made to loosen the bone with the side-curve and the right-angle rotation forceps. Again the bone could not be loosened, neither pulled up nor pushed down. These attempts to remove the bone covered a period of an hour, and it was felt that either the bone must be removed at that time or that it must be removed by a lateral esophagotomy. An unsuccessful attempt was made to bite off these spicules of bone by using the standard tissue forceps. Then it occurred to the operator that the long lip of the scope could be used as two points, with the tissue forceps as a third. The pointed area was grasped with the forceps, and the scope was then advanced down over the foreign body, as shown in Figure *2c*. By twisting the forceps and holding the scope rigid, the operator was able to break off small bits of bone with the greatest of ease. There was little rotation of the foreign body. It is noted in Figure 4 that these bits of bone were taken off successively, as indicated by the numbers and the bone which was reconstructed after the procedure. This was accomplished in seven or eight attempts. By breaking off pieces of bone, the operator was able to withdraw the foreign body with comparative ease.

The patient had a slightly stormy recovery. Her temperature reached 101 F., and there was some evidence of pneumonitis in her left lung. These signs subsided after the first day, and the patient made a fairly uneventful recovery. During the first two or three days, however, she had considerable pain in her chest and back, indicating the possibility of periesophagitis. Her blood cell count was somewhat elevated, showing a rather marked leukocyte count of 23,000 with 86% polymorphonuclear leukocytes. The leukocyte count gradually dropped after the procedure so that at the time of her discharge it was 10,200 with only 62% polymorphonuclear leukocytes. After the procedure she was given nothing by mouth for three days. She was placed on large doses of penicillin. On the fifth postoperative day she was discharged. No subsequent difficulty has been encountered.

COMMENT

A study of the contour of the bone revealed that it could not have been removed by any ordinary method generally used in typical cases. Shears have been made to cut through various articles lodged in the esophagus; however, they are rather dangerous to use and were not in the possession of the operator at the time of the incident. Since the removal of the bone, a rather careful study has been made in the use of this procedure for removing sharp-pointed and irregular chicken bones from the esophagus. It has been found that the use of the ordinary Jackson esophagoscope does not work very well with this method. An esophagoscope that is oval, has a larger diameter and a longer lip works much better in using the tissue forceps to break off the pieces of bone. On the manikin it was found that there are only about 10 to 15 degrees rotation of the bone. This small degree of rotation may be considered sufficiently safe that no tear or perforation will be made in the esophagus.

Special Reports

HEARING AIDS ACCEPTED BY THE COUNCIL ON PHYSICAL MEDICINE AND REHABILITATION AMERICAN MEDICAL ASSOCIATION

AS OF DEC. 1, 1953

Acousticon Models A-17 & A-185
Mfr., Dictograph Products Inc.
95-25 149th St.
Jamaica 1, N. Y.

Audiotone Models 11 & 15
Mfr., Audio Company of America
5305 N. 6th St.
Phoenix, Ariz.

Audivox Models Super 67 & 70
Mfr., Audivox, Inc.
123 Worcester St.
Boston 18

Aurex Models L & M
Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Beltone Mono-Pac Model "Lyric"

Beltone Mono-Pac Model M

Beltone Mono-Pac Model "Rhapsody"
Mfr., Beltone Hearing Aid Co.
2900 W. 36th St.
Chicago 32

Cleartone Models 500 & 700

Cleartone Regency Model
Mfr., American Sound Products, Inc.
1303 S. Michigan Ave.
Chicago 5

Dahlberg Model D-1

Dahlberg Junior Model D-2

Dahlberg Model D-3 (Tru-Sonic)

Dahlberg Model D-4 (Tru-Sonic)
Mfr., The Dahlberg Company
Golden Valley
Minneapolis 22

Fortiphone Models 19LR, 20A, 21C, & 22
Mfr., Fortiphone Limited
Fortiphone House
247 Regent St.
London, W.1, England

Distr., Anton Heilman
75 Madison Ave.
New York 17

Gem Models V-35 & V-60
Mfr., The Gem Ear Phone Co., Inc.
50 W. 29th St.
New York 1

Goldentone Models 25, 69, & 97
Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8

Distr., Goldentone Corp.
708 W. 40th St.
Minneapolis 8

Maico Maxitone

Maico Model J

Maico Quiet Ear Models G & H

Maico Top Secret Model L
Mfr., The Maico Company, Inc.
21 N. 3rd St.
Minneapolis 1

Micronic Model 303

Micronic Model Mercury

Micronic Star Model
Mfr., Audivox, Inc.—Successor to Western Electric Hearing Aid Division
123 Worcester St.
Boston 18

Microtone Classic Model T-9

Microtone Models T-10 & T-612
Mfr., The Microtone Company
Ford Parkway on the Mississippi
St. Paul 1

National Model D (Duplex)

National Ultrathin Model 504

National Vanity Model 506
Mfr., National Hearing Aid Laboratories
106 S. 7th St.
Philadelphia 6

Normatone Model C

Normatone Model D-53
Mfr., Johnston Hearing Aid Mfg. Co.
708 W. 40th St.
Minneapolis 8

Distr., Normatone Hearing Aid Co.
22 E. 7th St.
St. Paul 1

Otarion Models B-15 & B-30

Otarion Models F-1, F-2, & F-3

Otarion Models G-2 & G-3

Otarion Model H-1, Custom "5"
Mfr., Otarion, Inc.
4757 N. Ravenswood Ave.
Chicago 40

Paravox Model D (Top-Twin-Tone)

Paravox Model J (Tiny-Myte)

Paravox Model Y (YM, YC, & YC-7) (Veri-Small)
Mfr., Paravox, Inc.
2056 E. 4th St.
Cleveland 15

Radiocar Permo-Magnetic (Multipower)

Radiocar Model 62 Starlet

Radiocar Model 72

Radiocar Model 82 (Zephyr)
Mfr., E. A. Myers & Sons, Inc.
306 Beverly Rd.
Mt. Lebanon
Pittsburgh 16

Distr., Radiocar Corporation
306 Beverly Rd., Mt. Lebanon
Pittsburgh 16

Silvertone Models J-92 & P-15
Mfr., Johnston Hearing Aid Mfg. Company
708 W. 40th St.
Minneapolis 8

Distr., Sears, Roebuck & Co.
925 S. Homan Ave., Chicago 7

Solo-Pak Model 99
Mfr., Solo-Pak Electronics Corp.
Linden St.
Reading, Mass.

Sonotone Models 900, 910, 920, 925, 940, 966, 977, & 988
Mfr., Sonotone Corporation
Elmsford, N. Y.

Televox Model E
Mfr., Televox Mfg. Company
1307 Sansom St.
Philadelphia 7

Telex Models 99, 200, 300-B, 400, 500, 952, 953, & 1700
Mfr., Telex, Inc.
Telex Park
St. Paul 1

Tonamic Model 50
Mfr., Tonamic, Inc.
12 Russell St.
Everett 49, Mass.

Tonemaster Cameo Model
Mfr., Tonemaster, Inc.
400 S. Washington St.
Peoria 2, Ill.

Unex Midget Models 95 & 110

Unex Models 200 & 230
Mfr., Nichols & Clark
Hathorne, Mass.

Vacolite Models J & J-2
Mfr., Vacolite Company
3003 N. Henderson St.
Dallas 6, Texas

Zenith Miniature 75

Zenith Model Royal

Zenith Model Super-Royal

Zenith "Regent"
Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39

(All aforementioned hearing aids have vacuum tubes.)

Accepted hearing aids more than five years old have been omitted from this list for brevity.

Transistor Hearing Aids Accepted

Acousticon Model A-300
Mfr., Dictograph Products Inc.
95-25 149th St.
Jamaica 35, N. Y.
1 transitor, 2 tubes, and 2 batteries

Audivox Model 71
Mfr., Audivox, Inc.
123 Worcester St.
Boston 18
All transitor

Maico Transist-Ear, Model O
Mfr., The Maico Company, Inc.
21 N. 3rd St.
Minneapolis 1
3 transistors and 1 battery

Otarion Model C-15
Mfr., Otarion, Inc.
4757 N. Ravenswood Ave.
Chicago 40
1 transistor, 2 tubes, and 2 batteries (A & B)

Sonotone Model 1010
Mfr., Sonotone Corporation
Elmsford, N. Y.
1 transistor, 2 tubes, and 2 batteries (A & B)

Telex Model 954
Mfr., Telex, Inc.
Telex Park
St. Paul 1
1 transistor, 2 tubes, and 2 batteries (A & B)

Zenith Model Royal-T
Mfr., Zenith Radio Corporation
5801 W. Dickens Ave.
Chicago 39
3 transistors and 1 battery

Semiportable Hearing Aids

Ambco Hearing Amplifier (Table Model)
Mfr., A. M. Brooks Co.
1222 W. Washington Blvd.
Los Angeles 7

Aurex Semi-Portable
Mfr., Aurex Corporation
1117 N. Franklin St.
Chicago 10

Precision Table Hearing Aid
Mfr., Precision Hearing Aids
5157 W. Grand Ave.
Chicago 39

Sonotone Professional Table Set Model 50
Mfr., Sonotone Corporation
Elmsford, N. Y.

Society Transactions

CHICAGO LARYNGOLOGICAL AND OTOLOGICAL SOCIETY

Lawrence J. Lawson, M.D., President

Stanton A. Friedberg, M.D., Secretary

Monthly Meeting, Feb. 5, 1953

Surgical Treatment of Atresia of the External Canal. (A series of 40 cases, with a motion picture.) DR. PIERCE THEOBALD and DR. EUGENE DERLACKI.

The motion picture revealed details of the surgery performed in this series of cases, and Theobald and Derlacki elaborated on the technique in their discussion. Hope is expressed that the addition of these cases to the available literature will help to improve the results now being obtained in correction of this deformity.

Problems in the Use of Hearing Aids and Recent Trends in Their Solution. RAYMOND CARHART.

Three of the several problems which patients encounter in the selection of hearing aids are discussed. Each patient should be studied sufficiently to clarify his potential efficiency with a hearing aid and to indicate clearly the steps which will benefit him.

Some patients have severe intolerance for the stronger sounds produced by hearing aids. Instruments with compression amplifications can often meet this difficulty, but actual trial is necessary. Also, there are patients whose discrimination for speech is abnormally poor; many presbyacusics and patients with endolymphatic hydrops fall in this category. Extensive research is needed to clarify the factors responsible. Other patients have trouble because of unfavorable audiometric configurations, particularly those with a markedly greater loss at high rather than at low frequencies. Some degree of selective amplification is desirable, but the details need to be confirmed through research; there are limits to the variation in frequency response in instruments that are available. Unilateral listening is disadvantageous, because it interferes with localization of sound sources and causes imperfect reception in some situations. Many users blame the instrument for this trouble, and others use it with reduced confidence. The solution to this problem lies in giving the patient proper guidance. Careful audiological assessment and hearing-aid evaluation will enable the clinician to assist the patient to understand his problem and to realize what he may expect from a hearing aid.

Surgical Management of Carcinoma of the Tongue and Floor of the Mouth. (Motion picture.) DR. HANS VON LEDEN.

The high mortality resulting from these lesions can be attributed to the abundant lymph supply which favors early metastases to all parts of the cervical lymphatic system. On the other hand, metastatic involvement of distant areas by hematogenous spread occurs rarely.

Experience has shown that radiation therapy is not an effective weapon in destruction of carcinomatous extensions in the cervical lymphatic chain. Adequate dosage directed to the primary lesion also may cause secondary necrosis of soft tissues and bone.

Surgery, with or without preoperative irradiation, is proving most effective if the primary lesion and related lymphatic system are removed en bloc. The combined operation includes removal of part of the tongue, floor of the mouth, mandible, and entire cervical lymphatic system on the involved side; it is known as the commando operation. Recent advances in anesthesia, antibiotics, and blood replacement have made the wider application of this operation practicable. In properly selected cases the surgical risk is slight, and the morbidity in these cases compares favorably with those treated with extensive irradiation therapy. Adequate cosmetic and functional rehabilitation can be accomplished by secondary plastic reconstruction if indicated.

Two patient were presented in whom a commando operation was employed. The operation consists of three stages: (1) radical dissection of the lymph-bearing structures on the involved side of the neck, extending from the base of the skull above to the clavicle below and from the ribbon muscles anteriorly to the trapezius posteriorly: (2) removal of the horizontal ramus of the mandible, half of the tongue, and the floor of the mouth on the involved side in continuity, and (3) tracheotomy to ensure a satisfactory air exchange in the immediate postoperative period. Microscopic sections from the primary lesion, floor of the mouth, and cervical lymphatic system proved the extent of malignant infiltration beyond the apparent confines of the tumor. Postoperative pictures of these pictures indicate minimal functional and cosmetic deformity.

Monthly Meeting, March 2, 1953

Frequency Localization in the Cochlea as Determined in Experimentally Deafened Cats. (Candidate's thesis). DR. HAROLD F. SCHUKNECHT.

One method of determining the spacial distribution of frequencies along the cochlear duct is to create cochlear lesions in animals and correlate the resulting functional and pathologic changes. This can be accomplished only if reliable quantitative methods are used in testing the hearing and recording the cochlear pathology. The most accurate technique yet devised for determining the auditory thresholds of animals is avoidance–conditioning. The repeat reliability of this method is about ± 5 db. Spacial orientation of intracochlear pathology can be determined by graphic reconstruction, with an error which is probably less than 5%. Experimental lesions were made in the cochleas of 26 cats, after which audiograms and cochlear reconstructions were made. In 16 there were abrupt hearing losses, and the cochlear lesions were of limited size. The margins of these lesions were characterized by an abrupt change from abnormal to normal of the sensory (and/or neural) elements. The method used to correlate functional and pathologic changes is indicated in the following example:

Cat 1 had a normal auditory threshold for frequencies from 125 to 8000 cps. The frequency 16,000 cps, however, was not heard at an intensity of 65 db. above its preoperative threshold. Histologic examination of the cochlea revealed a loss of outer hair cells and some inner cells to the 6.8-mm. point (as measured from the basal end), beyond which the cochlea was normal. Thus the margin of the lesion (6.8 mm.) appeared to be somewhere between the points of maximum excitation for 8000 and 16,000 cps. Twenty such correlations were made from 16 ears. One correlation was made for the frequency range 250 to 500 cps, two for 500 to 1000 cps, two for 1000 to 2000 cps, two for 2000 to 4000 cps, seven for 4000 to 8000 cps, five for 8000 to 16000 cps, and one for 16000 to 32000 cps. When the mean distances were plotted as a function of frequency, it was found that the point of maximum excitation for 32,000 cps was 9% of the distance along the cochlear duct, 16000 cps at 21.3%, 8000 cps at 33.6%, 4000 cps at 45.9%, 2000 cps at 58.2%, 1000 cps at 70.5%, and 500 cps at 81%.

It should be understood that the orderly arrangement of frequency response along the cochlear duct does not necessarily strengthen the "place" theory of pitch perception. It appears that the fields of excitation are not so sharply localized that pitch perception can be accounted for on this basis alone. It might be well to borrow the terminology of Ruch who referred to cortical excitation in terms of "modal excitation fields" (modal implying only that they are peaked). Thus the cochlear response to a pure-tone stimulus does not occur at a point of excitation but in a "modal excitation field."

DISCUSSION

DR. SHERMAN SHAPIRO: Dr. Schuknecht has given a definite anatomic basis for the clinical facts in otosclerosis in that the conductive impulse does not reach the low-tone area, thus diminishing the hearing for low tones.

DR. ALFRED LEWY: That does not explain the loss for high tones which also occurs in otosclerosis. Even when the loss is in the low tones, there is also some loss in the high registers.

DR. JOHN BALLENGER: I should like to ask if any studies were made of the differential functions of the inner and outer hair cells. In other words, have you instances in which only the outer hair cells were destroyed, and what resulting abnormalities were noted?

DR. HAROLD F. SCHUKNECHT: In answer to Dr. Ballenger, let me say that little is known regarding functional differences between inner and outer hair cells. From my own investigations on cats, I was able to provide some information on the effect of progressive stages of hair-cell injury on auditory thresholds. For stimulus intensities up to 4000 cps, a partial loss of outer hair cells (within the excitation fields for these frequencies) causes a threshold elevation of less than 50 db.; a total loss of outer hair cells in a particular region causes an elevation of about 50 db. for the involved frequencies, and a loss of outer plus some inner hair cells causes threshold elevations of more than 50 db. Total loss of hair cells results in total deafness in frequencies having their fields of excitation within these regions.

Electrolyte Studies on Ménière's Disease. DR. HENRY B. PERLMAN and DR. JAMES M. GOLDINGER.

Fifteen patients with active Ménière's disease were hospitalized from two to four weeks for a careful study of their sodium, potassium, and water metabolism. Both a measured decrease in serum sodium and a measured increase in serum sodium were produced, and their effects on the vestibular and cochlear manifestations of this disease were noted.

By maintaining a severe sodium restriction in the diet (300 gm. daily) and administering 4 to 8 gm. of ammonium chloride, 2 cc. of thiomerin every other day to prevent sodium conservation of the kidney, and occasionally aminophylline intravenously, a moderate lowering of the serum sodium level was achieved in the first group of patients.

In the second group of patients extra dietary salt was provided in amounts up to 8 gm. per day, and the retention of this extra salt was brought about by giving these patients varying amounts of desoxycorticosterone, a steroid which causes sodium retention, probably by affecting more complete sodium reabsorption by the renal tubule. A significant measurable increase in serum sodium concentration was produced.

No consistent effects on cochlear or vestibular function were noted in patients with a measured low serum sodium, as random fluctuations in hearing continued and some acute severe attacks of vertigo were observed. No acute attacks of vertigo were observed in patients whose serum sodium had been sharply raised, and no consistent deterioration of cochlear function was produced. A number of these patients even had significant and sustained improvement of cochlear function during and following such treatment.

The Kepler water test failed to reveal impaired water diuresis in these patients, and no changes in vestibular or cochlear function were noted during the course of the test.

DISCUSSION

DR. ROBERT HENNER: While my question is not exactly pertinent to this discussion, I should like to ask whether Dr. Lindsay and his group have ever attempted to study electrolytes during destructive labyrinthotomy and if such studies have been made by other men doing that type of research.

DR. HENRY B. PERLMAN: We have not made any series of determinations of the sodium, potassium, and chloride during the acute vestibular disturbances in Ménière's disease. We have, however, had occasion to draw blood from two hospitalized patients at the time they were having acute attacks of vertigo, and no changes in the electrolytes were found.

Clinical and Laboratory Observations on Conduction Deafness. (Motion picture.) DR. HEINRICH G. KOBRAK.

For a better understanding of impedance deafness, studies correlating function and morphology are essential. Twenty years ago Polvogt published a series of morphologic-functional examinations in the middle-ear disease. In the present study an important change was made from Polvogt's work at Johns Hopkins University. It was felt that examination of the structural middle-ear changes does not have to be on autopsy material. Certain changes can be studied satisfactorily by a method which may be called "biomicroscopy" of the middle ear.

This paper attempts to demonstrate the method of ear biomicroscopy and to outline some of the results. The method consists in producing enlarged photographs of the ear structures in both

animals and humans. Photographic recordings not only are useful for demonstration purposes and in teaching others but also are helpful in analyzing the pathology and making quantitative measurements.

The enlargement obtained by ear drum cinematography is a low-power magnification produced by the lens system (object to image ratio was about 1:3) and by the projection. (Slides were shown to demonstrate the method.)

A motion picture was shown to demonstrate clinical otoscopic findings simultaneously with the auditory function. The absolute threshold of hearing was measured by pure-tone audiometry.

The first four cases had one feature in common with those in Polvogt's study. They were clinical cases with considerable otoscopic pathology, but still the hearing function was normal within 15 db. One important difference exists between Polvogt's autopsy material and mine; in the latter there was no time lag between making the audiogram and the photographic recording of the morphology. In half of Polvogt's patient's, there was an interval of three months between the hearing test and the date of autopsy. In my material the hearing test was performed within a few minutes after the cinematographic recording was made.

It is evident that a considerable amount of structural changes in the pars tensa may occur without changing the function. A retraction or even a synechial connection with the promontory can be found with good function remaining. A small amount of fluid in the hypotympanum above the window level is still compatible with nearly normal hearing. A glomus tumor was demonstrated in which the growth was confined to the hypotympanum. A hearing loss of about 10 to 15 db. was observed.

The second part of the demonstration consisted of case presentations in which the morphologic changes were contrasted with the audiometrically measured hearing losses. A classification of various type of impedance deafness was given.

Monthly Meeting, April 6, 1953

Cardiac Arrest. (Motion picture.) DR. E. H. FELL and DR. LOWELL F. PETERSON (by invitation).

DISCUSSION

DR. THOMAS C. GALLOWAY: This film has removed some of the mystery connected with cardiac arrest, which has been thought of as something peculiar, occurring in rare instances—a condition for which no one can be blamed and for which there is no particular explanation. However, the explanation may be rather simple. A heart that responds to a severe vagus effect, if it is a normal heart, will usually escape after a period of slowing and even temporary rest. But a heart that has been damaged by anoxia, myocarditis or previous infection may not do so. After all, cardiac arrest occurs because there is some fault, usually with the anesthetic, or in the position, which permits collapse of the trachea, inattention to breathing, an unclear airway; or, especially, that condition which needs to be emphasized, spasm of the vocal cords. Coryllos showed that spasm may produce asphyxial death in submergence, even without flooding of the lungs. Spasm may be due to instrumentation, and especially in the presence of sodium pentothal, it may occur when the instrument is withdrawn from the trachea. As laryngologists, we must teach anesthesiologists that the airway must be clear at all times, that even a few seconds of anoxia is dangerous, and that between three and five minutes of anoxia may result in death. Coryllos showed that in the third phase of respiratory asphyxia, which comes in the third minute, there is a period of only 10 to 15 seconds in which it may be possible to resuscitate the animal.

It is hoped that none of us will ever have to undertake these heroic measures. I do not believe that the laryngologist would know what to do or be able to do it. But I believe that it is important to reemphasize the need for avoidance of anoxia. There may be some cases which occur with manipulation within the mediastinum, with certain reflex mechanisms, but usually the condition will result only when the proper attention has not been given to maintenance of a clear airway.

The expression "massage of the heart" is used a great deal. I should like to ask how much of this is active stimulation of the musculature and how much is due to substitution of manual pump pressure to make the heart reestablish its function as a pump and circulate the blood to both the heart muscle and the brain. It is to be borne in mind that the heart muscle is much less

vulnerable than the nervous tissue. The limit of recovery of the brain is probably three, five, or, at most, eight minutes. The heart muscle apparently under some circumstances may have a considerably longer period of recovery; so whatever may cause cardiac arrest, the attention still should be focused on the central nervous system damage.

DR. LOWELL F. PETERSON: The accident of cardiac arrest was almost unheard of in the days of ether anesthesia or else was rarely diagnosed. These days it has to do with the so-called balanced anesthesia consisting of a little of this and a little of that—cyclopropane, nitrous oxide, a little pentothal, a little ether, a little curare—which produces such a complicated picture that the heart fails to respond in a normal manner.

It has been mentioned that atropine is a very good "protecting drug," particularly in long surgical procedures, and in such instances it is, no doubt, of considerable value. I should say that adequate administration of oxygen and maintenance of an open airway is most important.

Cardiac massage is not a trick procedure by any means, and I would urge you to go to your medical institutions and procure a dog to demonstrate the procedure. Produce cardiac arrest, and then massage the heart. It is comparatively simple if you do not have to do it more than three or four minutes, because after three or four minutes of cardiac compression you will be exhausted. From my own experience I should say that the most important thing is actual compression of the cardiac musculature, whether it is muscle stimulation per se or whether it is oxygenation, I am not in a position to say. But these hearts do go on to recovery if the anoxia has not extended beyond three to five minutes.

Metabolism of Fresh, Transplanted and Preserved Cartilage, DR. DANIEL M. LASKIN, D.D.S., M.S. and DR. BERNARD G. SARNAT.

Manometric analysis of carbohydrate metabolism (respiration and anaerobic glycolysis) of tissues in the Warburg respirometer offers a dynamic approach to the problem of cellular viability. These processes were studied in fresh rabbit costal cartilage autografts and homografts and in frozen-dried and thimerosal in saline (Merthosaline) preserved homocartilage after implantation subcutaneously in the abdominal wall of recipient animals for as long as 150 days. The metabolic activity of these tissues was compared with that of fresh rabbit costal cartilage, autoclaved fresh cartilage, and nontransplanted cartilage preserved (frozen-dried or thimerosal in saline) from seven days to three months. All specimens, whether for implantation or preservation, were utilized devoid of perichondrium.

The rate of respiration and anaerobic glycolysis of fresh costal cartilage was found to be among the lowest of all tissues. Carbohydrate metabolism was predominantly anaerobic. Both autografts and homografts showed approximately a 45% decline in respiration and anaerobic glycolysis during the first seven days following transplantation. After this initial decline, no further significant variations occurred in either group. The metabolic rate of the frozen-dried and thimerosal in saline-preserved cartilage approached zero after three months of storage. After implantation these specimens showed no change in carbohydrate metabolism.

These investigations indicated that in the rabbit fresh costal cartilage autografts and homografts remained viable for as long as 150 days after implantation. They also showed that a difference existed between the state of viability of these grafts and fresh costal cartilage. This has not been demonstrated by ordinary histologic methods. The low, predominantly anaerobic metabolism of cartilage probably contributes to its ability to survive transplantation. The preserved and autoclaved cartilage, as might be expected, were nonvital.

(A complete report appeared in *Surg. Gynec. & Obst.* **96**:493-499 [April] 1953.)

DISCUSSION

DR. OSCAR J. BECKER: Surgeons are primarily interested in the use of cartilage for grafting purposes, and many phases of the problem are clarified by this presentation. From the studies presented, it appears that both fresh autogenous and fresh homogenous rabbit cartilage are definitely living grafts after transplantation. This further substantiates the evidence found by histologic methods and my own clinical experience. As has been emphasized, preserved cartilage when transplanted is a dead graft or implant from a metabolic standpoint. Autoclaving, and probably boiling, of autogenous cartilage will also result in a dead graft.

From the experiments of Laskin and Sarnat using metabolic activity measurements, there apparently is not much difference between the frozen-dried and the thimerosal in saline method; both will destroy the viability of the chondrocytes. However, what happens to the cartilage matrix? Is there more of a chemical reaction and change by the thimerosal in saline method than by the dry-freeze method? These questions must have puzzled Laskin and Sarnat as well, since they stated that further investigation was necessary before a comparative evaluation was made. At present the fate of preserved cartilage is extremely variable, some grafts being completely absorbed within one or two years and others retaining their shape indefinitely. Naturally, many factors enter into the problem besides the method of preservation.

Perhaps the frozen-dried method will prove superior to the thimerosal in saline method for preserving the chemical composition of the cartilaginous matrix. Experiments to justify this conclusion have recently been published by the United States Navy Tissue Bank at Bethesda, Md., in a preliminary report. In my own experience I have seen preserved cartilage implants retain their shape and character in the nose for periods up to nine years, with histologic evidence of the survival of the cartilage matrix but with dead chondrocytes. That there is any metabolic activity between the mesenchymal fibroblasts which may have undergone metaplasia in the surrounding tissues or perhaps from the surrounding perichondrium or periosteum is purely hypothetical. Perhaps because of the low metabolic activity needed to maintain the cartilaginous matrix plus the low homotoxic reaction elicited by cartilage, as indicated by Loeb in his work on tissue and individual differentials, the surrounding tissues by forming a fibrous capsule around the implant may subserve the function of the chondrocytes.

The age of the donor of the preserved cartilage is another factor in the persistence of the implant. If young adult rib cartilage is used, the amount of chondroitin acid sulfate present in the matrix may make it resistant to infection and absorption. As is known, in older persons, the acid pH is lowered because of the loss of chondroitin sulfate. The lowered pH allows the enzyme alkaline phosphatase to prepare the cartilage for ossification by absorption. The importance of these chemical constituents is to be noted clinically by the more rapid absorption of transplanted cartilage from an older patient. (Septal cartilage, because of its high content of chondroitin sulfate, is perhaps a better grafting material.) These conclusions are somewhat substantiated by observations made in transplanting epiphyseal cartilage. This cartilage has a high content of alkaline phosphatase, since it is destined to undergo endochondral ossification and therefore clinically shows a high rate of absorption. Other factors, such as the recipient site, the amount of surrounding scar tissue, tension or strain on the implant, an infected field, whether placed in contact with bone or cartilage, whether imbedded in fat or muscle, and the size of the implant, are important considerations.

DR. SAMUEL SALINGER: These investigations have confirmed what has always been assumed, namely, that freshly implanted cartilage would preserve its viability. I have always felt that the process of boiling cartilage, which destroys its viability, renders it no more agreeable than preserved cartilage. As clinicians, we are extremely interested in the reasons why certain transplants will persist over an indefinite period of years, while others will absorb, and I believe that possibly future investigations along the line of the present one may shed some light on that subject.

DR. DANIEL M. LASKIN: I am in agreement with Dr. Becker that the state of the cartilage matrix is probably an extremely important factor in determining the persistence of preserved homocartilage implants. Because of its character, resorption of cartilage is at best a relatively slow process. Whether resorption will occur depends in part on the immunologic response of the host. It would appear from both clinical and experimental studies that the antigenicity of homocartilage is more closely related to the metabolism of vital chondrocytes than to the foreign protein of the matrix. Thus it may be stated paradoxically that in a preserved homocartilage implant, perhaps it is the absence of viable cartilage cells which contributes to its acceptance by the host.

Dr. Becker is correct in saying that rapid freezing and dehydration should prove to be superior to refrigeration in thimerosal in saline for preserving the chemical composition of cartilage. On the other hand, it is possible that preservation in thimerosal in saline may so change the tissue as to reduce its antigenic properties. Further investigation and clinical trial must be carried out before a more accurate comparison of the two methods can be made.

Experiences with Fenestration Surgery. Dr. Frank Wojniak.

Fourteen years have elapsed since Lempert's monumental report on his first 100-odd patients with otosclerosis operated on by his one-stage endaural fenestration technique. Many thousands of fenestrations have been performed to date, but, owing to the technical difficulties of the procedure, the vast bulk of these operations have of necessity gravitated into the hands of a very few otologists. Yet Lempert's emphatic assertion that fenestration is not a one-man operation has encouraged many so-called occasional operators.

This is a discussion of some of the unique problems which confront an occasional operator, and a report is being made of 126 fenestrations performed during a period of seven years. Eighty-seven patients have been rehabilitated for all practical, social, and economic situations to the entire satisfaction of both the patient and those who come in close contact with him. In 35 patients, there was either no gain in hearing or the gain was not sufficient for adequate rehabilitation. The condition in four patients has been made worse by the operation.

While fenestration surgery in its various phases may offer many difficulties, it presents a challenge which should be met by more otologists.

DISCUSSION

Dr. George E. Shambaugh Jr.: Dr. Wojniak is to be complimented on his very good results and also on the faithful recording of his bad results along with the good ones. I believe that it is noteworthy that in his series closures have been relatively few, and it can be said that the problem of osteogenic closure, which used to be the chief problem of the operation, has receded greatly in importance.

I should like to mention a new development in the fenestration operation which has to do with the mechanics of the fenestrated ear. When sound enters the normal ear, it tends to enter the labyrinth through the round window as well as the oval window. The impedance-matching mechanism of the large tympanic membrane, the ossicular chain, and the small oval window causes a marked differential in sound pressure at the two windows, resulting in good mobility of the intralabyrinthine fluids. After fenestration, sound again tends to enter both windows, but in the absence of an impedance-matching mechanism there is less of a differential in sound pressure at the fenestra than at the round window; therefore, a successful fenestration leaves a deficit of 25 db. of conductive loss. The differential between the two windows may be increased by applying a thick layer of ointment onto the tympanic membrane obstructing the passage of sound to the round window. Following the suggestion of Kobrak, I have been using a petrolatum-cholesterol (Aquaphor) ointment for this purpose. Not every patient can be helped by this simple prosthesis, but more than half of the patients in whom it has been tried have shown a substantial gain of 5 to 10 db. for the speech frequencies. This, added to the gain already obtained from fenestration, results in a very gratifying level of hearing.

Dr. Robert Henner: I feel that Dr. Wojniak, in his modest interpretation of his results, has played down the whole situation to the extent that one gets a conservative viewpoint when thinking back to the days when there was no treatment for otosclerosis. Comment should be made in the light of his conclusions rather than on his presentation of the body of his paper.

Lempert and others have pointed out that the clinical diagnosis of otosclerosis cannot be made perfectly. When a diagnosis is made, it is clinical otosclerosis and not otosclerosis from a histologic viewpoint. When the tube is patent, the drum is clear, and there is definite conduction deafness, we assume that it is a case of otosclerosis, and until we have microscopic evidence, we have no way of contradicting that diagnosis. As to Schwartz's sign being typical of otosclerosis, I should rather not observe it in a case in which operation is contemplated. It is invariably a sign of associated nerve deafness in a progressive stage.

I do not consider a soundproof room essential for most patients sufficiently handicapped to be considered for surgery. Dr. Wojniak's selection of cases is essentially what Dr. Shambaugh has pointed out as Class A cases, and if one can limit himself to those his percentage of good results will undoubtedly be higher. The gratification that comes from operating on an occasional patient from a group in which the predicted results are poor and obtaining an unexpected good result is worth while.

So far as comparing fenestration results and the use of a hearing aid, my patients who were operated on successfully have been much happier so far as fidelity or volume is concerned.

In my army experience I had occasion to study patients with individual susceptibility factors toward the development of deafness. Patients with preclinical otosclerosis, those patients with 25 to 30 db. loss and normal bone conduction, were susceptible to airplane noise. I was able to predict that there would be loss of hearing in the course of their flying training. I believe that patients who lose their hearing subsequent to successful fenestration often do so through acoustic trauma in their occupation. After completion of the fenestration procedures, I have been protecting patients who are exposed to unusually loud noises with some type of defender. At Hines Veterans Administration Hospital, the eye department has developed a new use for a product called Elastomer, a plastic that is ordinarily used to protect telephone wire. It can be blended in color with the skin, is soft and pliable, and is not affected by soap and water or other cleaning agents or by temperature. It defends 15 to 20 db. in all frequencies except 2000 and 4000, in which it defends 30 to 35 db. This is an unusually protective range for any defender.

DR. FRANK WOJNIAK: The discussions of Drs. Shambaugh and Henner are gratifying to me. In connection with Dr. Henner's statement regarding the Schwartz sign, I have noted that even though the patient appears to be an ideal candidate for fenestration, if this sign is present the results are frequently not so good. It seems that probably the condition is malignant or in a very active stage, and that is why the Schwartz sign is so well demonstrated. Probably I do select primarily Class A cases more than Drs. Henner and Shambaugh do. I feel that the occasional operator cannot afford to take the chances they may be able to take. I believe it is unscientific to assume such a nihilistic attitude toward even an empirical method, be it a drug or a surgical procedure, as long as that procedure works in alleviating human misery even just a little. I am thoroughly convinced that the fenestration operation works.

ERRATUM

The correct dates and places for the Section Meetings of the American Laryngological, Rhinological and Otological Society are as follows:

EASTERN SECTION: Place: The Waldorf-Astoria Hotel, New York City
Time: Friday, Jan. 8, 1954

SOUTHERN SECTION: Place: The Brown Hotel, Louisville, Ky.
Time: Saturday, Jan. 16, 1954

MIDDLE SECTION: Place: The Park Plaza Hotel, St. Louis, Mo.
Time: Monday, Jan. 18, 1954

WESTERN SECTION: Place: University of Oregon Medical School, Portland, Ore.
Time: Saturday, Feb. 6, 1954

Abstracts from Current Literature

Ear

New Nervous Pathway for Ménière's Disease. Samuel Rosen, New York J. Med. **53**:1095 (May 1) 1953.

In 1861 Ménière described a clinical entity consisting of vertigo, deafness, tinnitus, nausea, and vomiting. He listed four types of recurring vertigo: (1) the type occurring suddenly, with vomiting brought on by the motion of the head, (2) the type that produces unsteadiness with unilateral veering, (3) the type that brings about a to-and-fro or up-and-down movement, and (4) the type in which the patient falls to the ground, with nausea and vomiting. These symptoms may be simulated by cardiovascular disease, multiple sclerosis, eighth nerve tumors, syphilis, etc. The disease has been a puzzle, but the accuracy of the original clinical findings has been verified. In 1938 Hallpike and Cairns were fortunate to obtain histologic studies of two patients with Ménière's disease; they found pathology in the utricle, saccule, and elsewhere, accounting for both cochlear and vestibular symptoms. Destruction of the internal ear through surgery may be useless, since all the symptoms may occur in the presence of a "dead labyrinth." Therefore the presence of other nerve routes must account for this phenomenon. Rosen has found them in the chorda tympani in 14 cases in which he sectioned the chorda tympani; two of the patients had no labyrinthine function on the affected side before operation (chordal section), with the other ear normal. Two illustrations are used to show the anatomy and explain the physiology. Rosen concludes that (1) the chorda tympani-nervus intermedius carries sonic and equilibratory afferent impulses, (2) the division of the chorda has eliminated vertigo and relieved tinnitus, preserving hearing and vestibular functions, and (3) a new pathway capable of producing Ménière's syndrome has been found.

Abstracter's Comment: This seems to be a genuine contribution to the study of Ménière's disease. It is based on painstaking and thoroughly scientific data and deserves great praise. Confirmation by other investigators is, of course, required and highly desired.

I. W. Voorhees, New York.

Discussion on the Management of Chronic Otitis Media. F. McGuckin, Gavin Livingstone, and Angell James, Proc. Roy. Soc. Med. **46**:11 (May) 1953.

A symposium was held on Dec. 5, 1952, with Air Vice-Marshal E. D. D. Dickson as president of the section on otology. Mr. F. McGuckin classified chronic otitis media into three groups: (1) postinflammatory type with residual inactivity, (2) the recurrent type, and (3) the continuous type. He stressed the importance of the "cardinal complaint," deafness, and the complaint of discharge or discomfort or all of them combined. If the case is obviously surgical, the physician must determine whether the primary aim is safety, a dry ear or restoration of function. Table I includes three headings: (1) Discharge, Discomfort or Danger, (2) Deafness, and (3) the Problem of Otogenic Intracranial Disease. There is also an "inaccessible" group in which extensive cholesteatoma and bone destruction over dura may be listed. By inaccessible it is inferred that McGuckin meant incurable save through surgery. He stated: "My surgical attack tends to be excisive, not a drainage operation." A review of the work accomplished in 23 years was presented. Of every 100 cases epithelialized, in 3 to 6 months "20 or 30 will break down again within a year and present new problems."

Mr. Gavin Livingstone spoke of (1) the mucoid ear, (2) the ear with granulations and cholesteatoma, and (3) the ear with attic suppuration. He regards the mucoid ear as "safe," that is, not dangerous to life. As for an ear with granulations and cholesteatoma, he fears cauterization is the necessary treatment. It is possible to dry many of these ears, but they often discharge again. Rapid recurrence of granulations calls for surgery. Livingstone prefers the endaural approach, but he may supplement it with the postauricular approach when it is indicated. The follow-up is highly important.

Mr. Angell James discussed the healed, quiescent and active types of chronic otitis media. First the physician must determine the extent of the pathology and then decide whether the treatment should be surgical or nonsurgical. X-ray and bacteriological studies are indispensable. The antibiotics may be useful.

I. W. Voorhees, New York.

Some Effects of Intense Sound and Ultrasound on the Ear. E. D. D. Dickson, Proc. Roy. Soc. Med. **46**:139 (March) 1953.

This paper was read before the Section of Otology of the Royal Society of Medicine on Nov. 7, 1952. Dickson, the president, is Senior Consultant and Consultant in Otorhinolaryngology to the Royal Air Force. He believes that noise levels have increased both in everyday life and in many occupations to the extent that hearing is often impaired. Noise is unwanted sound which gives discomfort to the human ear, the degree depending on the sound-pressure level, the frequency distribution, duration, and susceptibility of the auditor. Sonic frequencies lie between 20 and 20,000 cps. Supersonic frequencies signify speeds greater than that of sound. Sound waves in the air at 68 F. travel at 1,125 feet per second (about 760 miles per hour). One usually measures pressure rather than amplitude. The decibel is a ratio of power rather than an actual physical quantity; it expresses how much greater one sound is than another. By intense sound Dickson means sound that is strong enough to be perceived by some sense other than hearing, for example, perception in the sinuses or open mouth. At 120 db. airborne sound stimulates the sense of touch. Dickson describes methods of measurement which are too complicated to be described in an abstract. Instruments are still being devised to test ultrasonic influences. The ear is very sensitive to small variations of pressure in air and can also tolerate very large ones. It is less sensitive at low-intensity levels to low-frequency tones than at 500 to 5000 cps. Difficulty in hearing in a background of noise is due to the masking effect of such noise. Graphs are given to illustrate an analysis of noise spectrums. Damage to the organ of Corti results in degenerative changes, and this may take place in a few days or weeks after severe exposure to noise. The basilar membrane is destroyed. Exposure to 150 db. for several minutes is enough to cause widespread damage to the helicotrema for low tones and to the round window for high tones. There is no subsequent regeneration. The tympanic membrane and ossicles may show no changes. In regard to the vestibular portion, "We have no grounds for supposing that ultrasonic frequencies are responsible for any vestibular symptoms." However, certain flyers and attendants at the fields have reported dizziness and nausea at times, but these seem to have been evanescent.

When considering the hazards of intense noise, one should remember that the intensity scale is of greater importance than the frequency scale. Probably airborne ultrasonic vibrations do not constitute a hazard to hearing, although experimentation in this field has not been extensive.

Occupational hazards from machinery noise are definite and certain; therefore, every possible precaution and protection should be vouchsafed workers in factories. Hearing tests should be given at the beginning of employment and at frequent intervals thereafter.

I. W. Voorhees, New York.

Agenesis of the External Auditory Canal. J. M. Tato, J. A. Bello, and J. J. Castellano, Acta oto-rino-laring. Ibera Am. **4**:85, 1953.

The problem of agenesis of the external auditory canal is discussed. In cases of bilateral agenesis it is important to perform surgery early. Three to 4 years is the ideal age for surgery. At this age both the esthetic and the functional problems involved will be favorably influenced because of the following: (1) There is a greater chance for stereoacusia; (2) surgery acts as a prophylaxis of deafness; (3) surgery eliminates complications resulting from either otitis media or mastoiditis, and (5) a useful cavity is produced in case there is a necessity for a hearing aid in later life. In cases of unilateral agenesis early treatment is not as important. Tato and his associates describe their technique in three stages. The first step is a radical mastoidectomy which helps to evaluate the size and position of the tympanic cavity and its relation to the dural plate and the semicircular canals. If this cavity is extremely small and the dural plate of the middle fossa is low, the approach to the semicircular canal is very difficult. Tato and his associates remove this dural plate and insert an autogenous bony implant which has the

function of raising the dura, thus presenting a more adequate approach to the semicircular canals. The second step of the operation is a fenestration. The third step is the insertion of a dermal graft, preferably from the inner surface of the arm, which is shaped in the form of a finger of a glove. Tato and his associates report 15 cases in which they have had very gratifying results in reestablishing a well-lined mastoid cavity, with good hearing and a well-formed external auditory canal.

PERSKY, Philadelphia.

Pharynx

INDICATIONS FOR TONSILLECTOMY AND ADENOIDECTOMY IN CHILDREN. G. O. PROUD, Laryngoscope **63**:262 (March) 1953.

Although the tonsillectomy and adenoidectomy operations are perhaps the most abused in surgery, there are still definite indications for them. Adenoidectomy may often be done without removing the tonsils. Indications for adenoidectomy are mouth breathing, adenoid facies (rare), recurrent otitis media or secretory otitis, and hearing loss due to tubal obstruction. Surprisingly enough, adenoidectomy relieves the obstruction in many cases of vasomotor rhinitis.

There are certain indications for tonsillectomy. Some are quinsy, recurrent Vincent's angina or diphtheria of the tonsil, and frequent tonsillitis. The best age for tonsillectomy is between 4 and 12 years.

HITSCHLER, Philadelphia.

ENDOTRACHEAL ANESTHESIA IN CHILDREN. JOHN J. HOCHFILZER, Laryngoscope **63**:395 (May) 1953.

Hochfilzer stresses the value of endotracheal anesthesia, especially for tonsil and adenoid surgery. He asserts that if the tube is inserted properly there will be no complications. In over 500 cases, the only complications were 2 cases of hoarseness postoperatively. With intertracheal anesthesia the airway is kept open, preventing anoxemia, so commonly observed during tonsillectomy, and the danger of aspiration and asphyxia is eliminated. Hochfilzer feels that physicians should learn this method and use it routinely.

HITSCHLER, Philadelphia.

ACUTE FEBRILE PETECHIAL OROPHARYNGITIS: PRELIMINARY REPORT. MORTON B. WALLACH, SHIRLEY SCHMONES, and SIDNEY W. BEREZIN, New York J. Med. **63**:1553 (July 1) 1953.

What the authors call "an extremely contagious outbreak of acute febrile petechial oropharyngitis" was observed by them during July, 1952. One hundred cases have been collected, all "extremely contagious," in children only; no cases have been observed in adults. Incubation is from 24 to 48 hours when small vesicles appear on the hard and soft palate and pharynx. The temperature rises to 103 F., sometimes as high as 106 F. The child clutches his throat and complains bitterly of a headache and pains throughout his body; especially in the muscles and tarsal bones. The discrete vesicles coalesce, forming large hemorrhagic blotches. The cervical glands are enlarged and tender, but prostration is slight. The temperature decreases by crisis, but a sore mouth persists, with an occasional pustule on a tonsil. This is a brief self-limited disease, making it unnecessary for the patient to be hospitalized. The patient does not respond to penicillin but does respond to terramycin when the disease is in the prodromal stage. Laboratory and other work-up tests have not been sufficiently carried out as yet because of the short duration of the disease and the very acute symptoms, although the "course is benign."

ABSTRACTER'S COMMENT: This sounds like a viral infection which is rather quickly overcome by the defense mechanism of the body. This latter element is of particular interest and value if it can be worked out, for there are so many viruses which overwhelm the body against all defenses, natural and therapeutic.

I. W. VOORHEES, New York.

Larynx

PROBLEM OF ACUTE LARYNGOTRACHEOBRONCHITIS. A. R. EVERETT, Eye, Ear, Nose & Throat Month. **32**:142 (March) 1953.

From 1942 to 1951, one thousand forty-five patients with laryngotracheobronchitis were treated on the croup service at Willard Parker Hospital in New York. In this series there were 12 deaths, a mortality rate of 1.2%. This was a decided decrease from the 9% of the previous decade.

Laryngotracheobronchitis with obstruction is essentially a disease of infancy and early childhood. The administration of antibiotics and chemotherapy in the early stages of the disease has prevented the development of serious obstructive problems in many instances. If the respiratory effort is only slight, the patient should be kept quiet and comfortable in a cubicle, oxygen tent, or croupette, preferably with cool humidified oxygen. If, however, it appears that conservative procedures are not likely to prove successful, operative treatment should be instituted without loss of time.

Suprasternal, supraclavicular, intercostal, and epigastric retractions are positive signs of obstruction of the upper air passage. If the general condition becomes worse or if there is any evidence of increased respiratory obstruction and fatigue, intervention should be prompt or the child will rapidly exhaust himself. Direct laryngoscopy should be done if tracheotomy is contemplated and suction equipment and airway are readily available. This will afford the opportunity to clean the trachea and upper bronchi of troublesome secretions. If the decision is made to do a tracheotomy, as is more than likely at this stage, an airway or small bronchoscope should be left in place during the operation. With the life-saving tube in place, the immediate emergency has been met, and the tracheotomy can be carried out in an unhurried manner. The presence of an airway of this type should be mandatory in patients with severe, acute obstructive symptoms.

The tracheotomized patient must be constantly attended by a special nurse, who is instructed to keep the trachea and upper bronchi clear of secretions by frequent aspirations with a small, soft rubber catheter through the tracheotomy tube. Room air and especially oxygen have a very drying effect upon the lower air passages when shunted through a tracheotomy tube. A plan for humidification, preferably mechanical vapor, must be instituted. This prevents irritation of the trachea and bronchi and crust formation. The addition of a wetting agent in the water to be vaporized may prove helpful in preventing crusting and in lessening the viscosity of the secretions. Antibacterial agents are routinely continued in appropriate doses postoperatively to prevent pneumonia and to control the original infection.

JENNES, Waterbury, Conn.

ENDOSCOPIC DIAGNOSIS OF EARLY BRONCHIAL CARCINOMA. FERNAND EEMAN, J. Laryng. & Otol. **67**:266 (May) 1953.

Attention is called to the definite increase of bronchogenic carcinoma, and an evaluation of the methods by which an early diagnosis can be established is well presented. Bronchography, bronchoscopy, endoscopic biopsy, and cytodiagnosis are strongly advocated. Bronchoscopy and many of the problems encountered in performing it are discussed at length. There is always the question whether to perform the bronchoscopy or the bronchography first. The problem of pathological findings is of much interest to the reader, and a warning is issued in obtaining biopsy specimens that to bite deeply into a suspected neoplasm might induce fatal bleeding. Cytodiagnosis, originated by Papanicolaou, is of much value. The application of the different methods increases the chances of early detection in cases of bronchogenic carcinomas.

LEJEUNE and NORMAN, New Orleans.

TREATMENT OF ESOPHAGEAL VARICES BY TRANSESOPHAGEAL OBLITERATION. G. CRILE, Surg., Gynec. & Obst. **96**:573 (May) 1953.

Crile recommends transesophageal ligation of esophageal varices as a simple and safe method of dealing with esophageal varices which are secondary to extrahepatic blocks of the portal or splenic vein. He reports a series of seven patients with esophageal varices treated by trans-

esophageal obliteration and in whom there has been a follow-up 33 to 48 months after surgery. Five of the patients had no further bleeding since surgery, despite the fact that prior to the operation bleeding had occurred on the average of 15 times a year for several years and all other methods of treatment had been unsuccessful.

The technique is analogous to that of hemorrhoidectomy except that it is performed through the open esophagus. The operation was not applied to patients with cirrhosis of the liver, and Crile admits that since most of the patients in the series had had their spleens removed previously, it was not known whether the splenectomy and devascularization of the stomach contributed to the permanence of the effect of ligation of the varices.

There were no deaths or serious complications following surgery except for the development of a gastric ulcer in one patient whose stomach had been subjected to partial resection, vagotomy, and devascularization.

FRIEDBERG, Chicago.

DISCUSSION ON THE MANAGEMENT OF CERVICAL METASTASES FROM LARYNGEAL CARCINOMA. ROLAND S. LEWIS, Proc. Roy. Soc. Med. **46**:481 (July) 1953.

Lewis is an ear, nose, and throat surgeon of King's College Hospital, Mt. Vernon Hospital, and Radium Institute. He has had more difficulty with recurrence in lymph nodes after laryngectomy than with local recurrence but has encountered relatively few "distant metastases." The amount of occurrence of metastases varies from 2 to 6% in the brain, lung, and mediastinum. Lymph node involvement varies according to whether the laryngeal lesion is intrinsic or extrinsic. The former involves the vocal cords, ventricles, ventricular bands, the interarytenoid area, and subglottic regions. Cancer arising in these areas is said to be slow in growth and "relatively benign." Cancer invades the glands of the neck only at a late stage of the disease. Extrinsic areas are those not intrinsic, but a sharp line cannot be drawn between them. In extrinsic carcinoma the cervical glands are involved early and denote a higher degree of malignancy, so that the cancer may be well advanced when the nodes are first recognized. Presence of any lump in the neck calls for "suspicion" and accurate diagnosis. Laryngectomy without radical neck dissection is not to be recommended. There is often bilateral involvement of the lymph nodes. When this occurs, both sides should be done at one sitting or if only one side is done, three weeks should be allowed between sessions. Marginal carcinomas are those growths arising from the aryepiglottic folds and free parts of the epiglottis. Lewis always removes the hyoid bone and often half of the thyroid gland. "In subglottic growths three, or even four, rings of the trachea are taken." Lewis does not advocate block dissection for all intrinsic cancers but only for those that are supraglottic. "An intrinsic supraglottic cancer, if mobile and small, can be treated by deep x-rays, the glands being watched carefully, and a block dissection done if suspicious thickening occurs."

I. W. VOORHEES, New York.

Nose

PRIMARY MALIGNANT TUMORS OF THE NASOPHARYNX. R. M. GEIST JR., and U. V. PORTMANN, Am. J. Roentgenol. **68**:262 (Aug.) 1952.

Geist and Portmann review 72 consecutive cases of malignant tumors of the nasopharynx. During this time, a total of 325,000 new patients were seen at the clinic. Malignant tumors of the nasopharynx make up from 1 to 2% of the total number of malignant tumors. Grossly these tumors can be divided into three types: ulcerated, lobular, and exophytic. There has been disagreement on the histologic classification of tumors of the nasopharynx, particularly concerning the term lymphoepithelioma. Of the 72 malignant growths seen by the authors, the following histopathologic classification was made: transitional-cell carcinoma, 21; squamous-cell carcinoma, 19; lymphoepithelioma, 9; undifferentiated small-cell carcinoma, 4; adenocarcinoma, 1; basal-cell carcinoma, 1; lymphosarcoma, 6; reticulum-cell sarcoma, 1; fibrosarcoma, 1, and lipomyxosarcoma, 1. In eight cases pathologic classification was not possible, for various reasons.

One of the main reasons for the poor prognosis of malignant tumors of the nasopharynx is that most of the tumors are diagnosed relatively late in the course of the disease. Many of

the tumors which are producing symptoms and signs sufficient to bring the patient to a doctor are missed by the physician until they are relatively far advanced. There are four general categories of presenting symptoms: auricular, respiratory, and neurologic, and enlargement of cervical lymph nodes. The auricular symptoms result from obstruction of the Eustachian tube; the respiratory symptoms, from the presence of the tumor itself within the nasopharynx; the neurologic symptoms, from invasion of the base of the skull and pressure on the cranial nerves. Enlargement of the cervical lymph nodes represents metastasis. The first symptom in 15 of the 72 cases was neurologic. The tumors invade the bones of the base of the skull and grow through the foramen lacerum and the foramen ovale. After entering the middle cranial fossa, the growths usually remain extradural, producing compression of the cranial nerves. The fifth and sixth cranial nerves are most frequently involved, although the second, third, and fourth may also be implicated. The cranial nerves from the 9th to the 12th are located too far posteriorly to be involved intracranially, but they may be compressed or invaded by metastases in the retropharyngeal lymph nodes.

The most important procedure in establishing the correct diagnosis is a careful examination of the nasopharynx. Lateral and stereoscopic submentovertex roentgenograms of the skull are important to supplement the clinical examination in all cases.

X-irradiation is generally accepted as the only satisfactory form of treatment for malignant tumors of the nasopharynx. At the Cleveland Clinic deep x-ray therapy in the 200- to 250-kv. range is used, with a target-skin distance of 50 or 80 cm. The x-ray beam has a half-value layer of approximately 2 mm. cu. Two lateral and two maxillary portals are used in treatment. A skin dose of about 200 or 250 r is given daily until a tumor dose of about 4,000 r has been reached. Cervical metastases are treated by using large fields and irradiating to the limit of skin tolerance. In some cases the neck is treated even though enlarged lymph nodes cannot be felt. In far-advanced disease palliative x-ray therapy can be given for relief of pain. However, pain due to invasion of the base of the skull is seldom relieved.

Geist and Portmann have devised a method of staging the disease. Stage 1 is that in which the tumor is limited to the nasopharynx proper. In Stage 2 there may be palpable cervical lymph nodes but no other evident extension or metastasis. Stage 3 includes any advance beyond the first two stages, specifically invasion of the skull. As might be expected, the prognosis is best for Stage 1 and worst for Stage 3. Thirteen patients in Stage 1 were treated, and three of them survived five years.

WEILAND, Grove City, Pa. [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

DISCUSSION ON THE MANAGEMENT OF INJURIES OF THE NOSE AND UPPER JAW: THE EARLY TREATMENT OF FACIOMAXILLARY INJURIES. E. G. Collins, Proc. Roy. Soc. Med. **46**:473 (July) 1953.

Collins relates some experiences in treating gunshot wounds of the face and jaws during World War II. In extensive injuries it is well to do a tracheotomy at once and work out details of management later. Extensive débridement is seldom necessary, since much tissue will remain viable because of the splendid blood supply to the face. No fragment that has a chance of survival should be removed. Simple cleansing with soap and water plus a mild antiseptic may be sufficient. When there is a great loss of skin, no attempt should be made to draw the skin edges together under tension. Suturing should be limited to covering the bone edges and not extended to carrying out a primary suture complete with drainage. Antibiotics (penicillin powder) should be dusted into the wounds.

At the same session Mr. Pomfret Kilner discussed fractures of the nasal bones. Swelling may interfere with accurate diagnosis. In simple fractures without comminution, reduction is fairly easy, and splinting is seldom necessary. Kilner agrees with Negus in stressing the importance of maintaining asepsis and applying a disinfectant to the nasal vestibules. He has difficulty in setting cartilaginous fractures and dislocations because of the "springy nature" of the cartilage. The septum must be reduced and held in place by various means, and if this is impossible, then submucous resection is in order. Injuries to the lacrimal bone may result in epiphora. Usually the bone can be reset, but occasionally there must be a radical operation, which makes possible the conduction of tears into the nose. Obstructions to the nasofrontal duct may cause vacuum sinus headaches. The most critical injury of the ethmoid is fracture of the

cribriform, with tearing of the dura and loss of fluid. When this occurs, the neurosurgeon is called to do a "fascial graft repair." This is necessary to protect the brain from future infection via sinusitis. Major Calvert has advocated this form of plastic surgery and has reported statistics demonstrating his satisfactory results. In fractures through the frontal sinus involving the posterior wall, there is the same contingency, with cerebrospinal fluid loss and possible meningitis. The latter may appear months later. The value of conserving bone chips is mentioned, since these fragments resist infection well. "If every case of serious frontal sinus injury were handed over to the rhinologist by the neurosurgeon for regular follow-up, the necessity for performing obliteration operations on the frontal sinus would disappear."

Mr. D. S. Middleton spoke of fractures of the nasal bones, with special reference to the zygoma. Direct violence is always the cause, and the bone yields in spite of its "buttress nature." However, it is more often detached and displaced than fragmented. Since there may be involvement of the floor of the orbit, it is important to determine the extent of this complication because the globus may be disturbed, giving rise to visual disabilities. Checking the vision must be done before and after any operation on this area.

I. W. VOORHEES, New York.

Miscellaneous

DIPHENHYDRAMINE (BENADRYL) AND TRIPELENNAMINE (PYRIBENZAMINE) INTOXICATION IN CHILDREN. D. JOSEPH JUDGE and KENNETH W. DUMARS JR., A. M. A. Am. J. Dis. Child. **85**:545 (May) 1953.

This article deals with drugs left lying about the house in reach of children. A 2½-year-old girl in good health swallowed ten 50-mg. capsules of diphenhydramine. One hour later she was in the hospital with extreme excitation, muscular twichings, hallucinations, tremors, and disorientation. Lavage brought up the contents of the capsules. Her pupils were dilated and fixed. Temperature was 99.8 F., pulse rate 165, and blood pressure 76/48. After the administration of sodium phenobarbital and secobarbital (Seconal), she had a restless sleep for five hours. Quantities of dextrose solution were also given. Thirty hours later the child seemed fairly normal but very talkative. She was permitted to return home; recovery was evident on a follow-up examination.

A 2-year-old white child was hospitalized on Feb. 1, 1952, because of a sudden onset of extreme weakness following "a cold" with a cough and rhinorrhea. She had taken two 50-mg. tablets of tripelennamine. Vomiting and weakness followed ingestion of the drug; the child was unable to stand even with support. Temperature was 99.4 F., pulse rate 130, respirations 20, blood pressure 64/42. Her pupils were widely dilated, and there was coarse horizontal nystagmus, nasal discharge, and ataxia (to the right). The deep tendon reflexes were "hypoactive." Blood cell count was about normal save for the predominance of polymorphonuclear cells. The tested urine revealed a positive reaction to acetone. A throat culture showed hemolytic Streptococcus. An examination of the cerebrospinal fluid, a blood culture, and an x-ray of the skull gave normal results. Lethargy occurred, and a diagnosis of antihistamine poisoning was made. The child was given neostigmine (Prostigmin), methyl bromide, caffeine, and sodium benzoate. Because of the condition of the pharynx, she was given penicillin intramuscularly(dose not stated), with a favorable result in 24 hours.

There is no specific treatment in these cases of drug intoxication. Therapeutically, the maximum dose of antihistamines for children is 2 mg. per pound of body weight. When irritation of the central nervous system is evident, barbiturates may be given cautiously. Oxygen is indicated to ease the breathing.

I. W. VOORHEES, New York.

OCCURRENCE OF POLIOMYELITIS IN RELATION TO TONSILLECTOMIES AT VARIOUS INTERVALS. F. H. TOP, J. A. M. A. **150**:534 (Oct. 11) 1952.

Studies on the relationship between tonsillectomies and poliomyelitis have been concerned principally with the occurrence of the disease within a month of the surgical procedure. Many investigators are of the opinion that poliomyelitis occurs more frequently after recent tonsil-

lectomy than normally would be expected, and that, when it develops it is likely to result in a severer clinical type (bulbar or spinobulbar) if tonsillectomy has preceded an attack of the disease within 30 days.

The Detroit study, made in 1939, did not substantiate the finding of increased risk of tonsillectomy during a period of one month prior to an attack of the disease, but it did demonstrate the likelihood that a severer type of disease would develop. The present study is a survey of the tonsillectomy status of patients admitted to the Herman Keifer Hospital during the period from 1940 to 1949, and does not include the 1939 experience.

During the 1940-1949 decade, 1,947 patients who had had poliomyelitis were discharged from the hospital. Of this group, 1,011 patients gave a history, and on examination showed evidence, of removal of the tonsils. The proportion having undergone tonsillectomy was 51.9%.

High percentages of patients who had had tonsillectomy had the bulbar or spinobulbar type of poliomyelitis. The rates for these types were 85.1 and 68.7%, respectively, as compared with 45.6% for the nonparalytic type and 43.1% for the spinal type. The fatality rate of 93.5% for the bulbar type when tonsils had been removed was still more striking and was in marked contrast to that for the spinobulbar type (56.9%).

The time elapsed between tonsillectomy and an attack of poliomyelitis was studied. The proportion of patients with a history of tonsillectomy within one month of an attack was only 2.1%, and that for a period of less than one year was 8.3%.

These data are challenging in their implications and call for sober judgment with regard to the desirability of removal of tonsils except when there are excellent clinical indications. The data here presented are strongly suggestive that there is a greater chance of a severe form or of a fatal termination if tonsils have been removed at some time prior to an attack of poliomyelitis.

ALPERS, Philadelphia [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

ADVANCES IN THE USE OF ANTIBACTERIAL SUBSTANCES. PAUL A. BUNN, Laryngoscope **63**:128 (Feb.) 1953.

The newer antibiotics are described. Erythromycin and magnamycin are comparable to chlortetracycline (aureomycin) (best for Gram-positive organisms) and about as effective. Thiocymetin is active primarily against Gram-negative organisms.

Stilbamidine has been found effective against blastomycosis. Derivatives of isonicotinic acid hydrazide will act as well as streptomycin against tuberculosis, and the combination is particularly useful. Neo-Penil (the hydroiodide of diethylaminoethyl ester of penicillin G) is the first penicillin preparation that will penetrate the cerebrospinal fluid.

Bicillin (a combination of two parts penicillin and one part N,N'-dibenzylethylenediamine) is a form of penicillin that is extremely slowly absorbed. It will give blood levels for over seven days, and although these levels are not high enough for combating active infection, they are valuable prophylactically. Generally speaking, the use of two or more agents to combat an infection is to be condemned. Harm may result, and the effectiveness is not increased. There are some rare exceptions to this rule, which are mentioned.

Infections, including those of the ears, nose, and throat, are generally within the tissues. The administration of antibiotics locally is probably useless. It is important that a streptococcic sore throat be treated for at least five days; if for less, the incidence of rheumatic fever and glomerulonephritis is increased.

Meningococcic and pneumococcic meningitis can be best treated with the administration of penicillin parenterally, 1,000,000 units every two hours for 10 to 14 days.

Tuberculosis is an exception in that it is best treated by a combination of drugs, and the treatment must be continued or months. Avoid using dihydrostreptomycin, since it is far more dangerous to use than is streptomycin.

HITSCHLER, Philadelphia.

LOSS OF TASTE AND SMELL DUE TO PROPYLTHIOURACIL THERAPY. SOL GROSSMAN, New York J. Med. **53**:1236 (May 15) 1953.

This drug is used in treating thyrotoxicosis. Three cases previously reported by others concerned an anologue of the drug, methylthiouracil. This report concerns a 67-year-old woman with a well-documented history of thyrotoxicosis for some years. Her symptoms were due

to a hyperthyroid state plus a painful, swollen left knee. There was also an egg-sized mass in the right thyroid region; the gland was smooth, soft, and regular. She would not consent to surgery; therefore, propylthiouracil, 100 mg. per day, was prescribed with the usual instructions as to follow-up. The patient was not seen until a year later when she returned complaining of a cold, with complete loss of smell and taste. An inquiry concerning the thyroid condition revealed that the patient had been out of town most of the time. The drug was discontinued by her own volition, with some return of the two senses, especially her sense of smell. During the entire period she maintained a high dosage of vitamin B complex, and yet nerve impairment developed. Some thyrotoxicosis remained but no vitamin deficiency. "The disturbance proved to be benign."

ABSTRACTER'S COMMENT: Can one be sure about the alleged "cold"? What kind of a cold? Ear, nose, and throat specialists have reported loss of smell and taste in patients with attacks of influenza, which are certainly often diagnosed as "colds." This loss may be reversible or may remain to plague the patient.

I. W. VOORHEES, New York.

SEVERE REACTIONS TO BENADRYL. AARON D. SPIELMAN, New York J. Med. **53**:1576 (July 1) 1953.

Diphenhydramine (Benadryl) is coming to be regarded as helpful in allergic conditions and is therefore in common use, with few contraindications. Spielman's patient, a woman aged 30, had allergic rhinitis and conjunctivitis. She had taken tripelennamine citrate (Pyribenzamine) on previous occasions, but having none, she ingested a 50-mg. capsule of diphenhydramine. One hour later she felt ill. There was a great apprehension of impending death accompanied by tachycardia, nausea, urethral spasm with inability to void, pallor, and shock. Her blood pressure was "low"; but after she was given stimulants (caffeine, etc.), hypertension developed with more tachycardia and generalized cramps in the muscles. In a few hours most of these symptoms had disappeared except tachycardia. The blood cell count showed few eosinophiles. The electrocardiogram taken after the stormy symptoms lessened showed striking changes reported as "sinus tachycardia with a ventricular rate of 133." The T-wave was considered to resemble that observed in anaphylaxis with serum carditis. There was a suggestion of pulmonary infarction and electrolytic changes with a prolonged Q-T interval.

Although this patient made a successful recovery, the physician needs to observe caution in treating patients with allergic conditions, many of whom are already sensitized to the drug about to be administered. Anaphylaxis is the condition commonly described. The antihistaminics cannot be used with impunity. A careful history may disclose previous symptoms on taking antihistamines which have long been forgotten by the patient.

I. W. VOORHEES, New York.

INFLUENZAL MENINGITIS; RECOVERY OF CASE OF FOUR WEEKS' DURATION WITH USE OF NEW DRUG, POLYMYXIN B (AEROSPORIN). B. M. KAGAN, Pediatrics **4**:319 (Sept.) 1949.

Kagan reports on one male infant aged 13 months with influenzal meningitis. The diagnosis was made early, and streptomycin and sulfadiazine were administered in large doses. After two weeks, when progress was unsatisfactory, the infant was given Alexander's specific rabbit anti-influenzal serum, in addition to continued treatment with streptomycin and sulfadiazine. The medicants were discontinued after four weeks, when a fatal termination seemed inevitable. A new antibiotic, polymyxin B hydrochloride (aerosporin) was then administered. Seven milligrams (70,000 units) in 1 cc. of isotonic sodium chloride solution was given intramuscularly every four hours. The first day of this treatment 1 mg. (10,000 units) in 0.5 cc. of isotonic sodium chloride solution was given intrathecally as well, and 3.5 mg. (35,000 units) of the drug was given by this route, on the following days. On the fourth day the child seemed to be more toxic, but improvement thereafter was rapid, and there were no other symptoms or signs of toxicity which might be attributed to the polymyxin. The drug was discontinued after six days of administration. The infecting strain of Hemophilus influenzae type B was resistant in vitro to 80 units of streptomycin and was partially inhibited by sulfadiazine, but was sensitive to 0.43 units per cubic centimeter of polymyxin B hydrochloride. Reexamination of the patient three months later revealed that he was functioning intellectually on a low normal level for his age. There were no neurologic or other physical defects.

J. A. M. A.

TREATMENT OF DEVELOPMENTAL MALFORMATIONS OF THE JAWS. J. M. CONVERSE and H. H. SHAPIRO, Plast. & Reconstruct. Surg. **10**:316 (Nov.) 1952.

Converse and Shapiro present a classification of different jaw malformations resulting from faults in embryological development or disturbances of growth after birth. These abnormalities are analyzed, described in detail, and fully illustrated by outline and artist's drawings. Excellent photographs illustrate the before and after operation appearances. Four case histories serve to make a very clear presentation of the subject under consideration. A bibliography of 24 references is appended.

SELTZER, Philadelphia.

EFFECT OF INTRATHORACIC VAGAL STIMULATION ON THE ELECTROCARDIOGRAM TRACING IN MAN. D. R. MORTON, K. P. KLASSEN, J. J. JACOBY, and G. M. CURTIS, Surg., Gynec. & Obst. **96**:724 (June) 1953.

Morton and his associates have had considerable experience in transecting the homolateral vagus nerve as a palliative measure in a number of patients with inoperable bronchogenic carcinoma. This operation has resulted in the alleviation of cough and deep chest pain, without any adverse sequelae. Some consideration was given to the initial performance of these procedures inasmuch as vagal manipulation has been heretofore thought to be responsible for sudden death due to cardiac arrest. The present study is based on the electrocardiographic findings in 30 patients who were found to have inoperable bronchogenic carcinoma at the time of exploratory thoracotomy.

The electrocardiograms were obtained preoperatively, during the operation, while traction was applied to the vagus nerve, and during other intervals concerned with transection of the vagus nerve for these patients. Morton and his associates conclude that only two of their patients gave evidence of cardiac changes due to vagal stimulation. These changes were transient and were of a minor nature.

The relative infrequency of cardiac changes secondary to vagal stimulation suggested that in patients under satisfactory anesthesia, cardiac arrest due to vagovagal reflex is less common than has been previously supposed.

Observations of other patients, in whom cardiac irregularities and cardiac arrest occurred during intrathoracic procedures, suggest that anoxia is probably the most important factor in the pathogenesis of such cardiac derangement.

FRIEDBERG, Chicago.

OLD CEREBRAL ABSCESS: RECURRENCE OF SYMPTOMS AFTER TWELVE YEARS. H. FELDMAN, Schweiz. Arch. Neurol. u. Psychiat. **66**:40, 1950.

On a hot, sunny day in August, 1937, a previously healthy man suddenly experienced headache and vertigo. His vision was disturbed the following morning, and, after falling from his bicycle, he was unable to get up because of paralysis involving the left arm and leg. The tendon reflexes were more active on the left side than on the right, but otherwise the hemiplegia was of the flaccid type. Left hemianesthesia was also observed. Lumbar puncture two hours after onset of hemiplegia was followed by a rapid return of power to the left arm and leg. The spinal fluid was under high pressure but was otherwise normal. The patient was in good health thereafter until March 9, 1949, when he received a blow to his abdomen. Four days later he experienced vertigo and paresthesias in the left lower limb. Rapidly progressive and ascending hemiplegia involving the left side came on the next day. Severe headache, projectile vomiting, and symptoms of meningitis with fever quickly ensued. A high count of polymorphonuclear leucocytes in the cerebrospinal fluid subsided after treatment with antibiotic drugs, but the general condition grew worse, and a large abscess deep in the right parietal lobe was evacuated. The patient died March 23.

Autopsy revealed a well-encapsulated abscess in the superior and internal portion of the centrum semiovale on the right side. This abscess had ruptured into the subarachnoid space on the medial surface of the posterior portion of the superior frontal gyrus; it communicated with a much larger, unencapsulated abscess in the parietal lobe. Cultures of pus obtained from the recent cerebral abscess and from one in the left faucial tonsil revealed a nonhemolytic Streptococcus. No evidence of a suppurative process was found elsewhere in the body.

DANIELS, Denver [A. M. A. ARCH. NEUROL. & PSYCHIAT.].

SO-CALLED RHEUMATIC FACIAL PALSY: SURGICAL ASPECTS. KARSTEN KETTEL, Ugesk. læger **115**:353, 1953.

During the years from 1939 to 1952, Kettel has operated on 269 patients with peripheral facial palsy. In 30 patients plastic operations only were performed, since the facial muscles at the time of the patient's admission had atrophied, contraindicating an operation on the facial nerve.

The Ballance-Duel operation was performed on 239 patients; among them 97 belonged to the group called "rheumatic" facial palsy or Bell's palsy. The article deals only with these patients.

Pathology—Knowledge of the etiology is very limited. Many patients were exposed to cold immediately before the palsy developed, but other factors, such as allergy and emotional strain, may cause a "rheumatic" facial palsy.

The pathogenesis, however, is clear. Everything indicates that Bell's palsy is due to the fact that ischemia exists near the stylomastoid foramen—an arteriospasm, according to Hilger. The ischemia is the primary cause of the palsy, and resulting from it, various structural alterations take place in the facial nerve between the lateral semicircular canal and the stylomastoid foramen, at which point the nerve leaves the Fallopian canal; in some cases these changes occur in the surrounding bone also. The nerve becomes unduly constricted at the stylomastoid foramen, and tiny hemorrhagic streaks can be observed in the nerve running longitudinally. The nerve becomes edematous. The swelling of the nerve in the bony inelastic canal results in compression of the adjacent blood and lymph vessels, and, consequently, a vicious circle arises. This process is reversible, making the prognosis, on the whole, good.

The alterations in the nerve have been demonstrated by many surgeons. Kettel, moreover, has found in some cases ischemic changes in the adjoining bone, especially in the mastoid cells near the stylomastoid foramen, as well as in the Fallopian canal. This bone is nourished by the same vessels as the facial nerve.

In 3 out of 97 cases the nerve was definitely edematous, and in 3, atrophic. In 17 patients an ischemic necrosis with exudation was found in the mastoid cells, particularly at the tip of the mastoid process. In 5 of these cases the alterations were very pronounced, in 12, limited. Moreover, in 20 patients the wall of the Fallopian canal, normally as hard as ivory, was soft and very easy to open. Microscopicallyl, aseptic bony necrosis was demonstrated, but neither round-cell infiltration nor granulation tissue was observed.

These findings have recently been confirmed by Swedish surgeons. It seems that the course of the palsy and the pathological alterations are both connected with the environment and that the palsy occurs more often and more severely in the northern countries.

The term "rheumatic" facial palsy, or Bell's palsy, is misleading. It is a "collective diagnosis" covering all cases in which it has been impossible to demonstrate a definite cause. The majority of the cases are due to ischemia, and the term "ischemic facial palsy" ought to replace the term "rheumatic paralysis."

Therapy—Approximately 85% of the patients with ischemic facial palsy recover under medical treatment, which must be directed toward relieving the arteriospasm and include the use of Clemmesen's myotensor to keep the muscles in working order.

No general agreement has been reached on the indications for surgical intervention. This is due to the fact that no test is available which can distinguish with certainty between the 85% of the patients who recover spontaneously and the remainder. Response to faradic current is valuable but not absolutely reliable, and opinions differ regarding the value of electromyography.

The very few surgeons with extensive personal experience suggest decompression in patients in whom the faradic response is negative and no sign of spontaneous movement has occurred in six to eight weeks. In patients in whom spontaneous recovery has come to a standstill while still incomplete, further improvement may be obtained by decompression.

In a case of recurring ischemic palsy, however, decompression is always indicated, as there is general agreement that patients in whom this has been performed never have a relapse. This is probably due to the establishment of a collateral circulation near the stylomastoid foramen as well as to the opening of the Fallopian canal, in which the nerve becomes secondarily compressed.

KETTEL, Copenhagen, Denmark.

Books

Diseases of the Esophagus. By Philip Thorek, M.B., F.A.C.S., F.I.C.S., Associate Clinical Professor of Surgery, University of Illinois College of Medicine; Professor of Esophageal Diseases and Clinical Surgery, Cook County Graduate School of Medicine. Drawings by Carl T. Linden. Price, $10. Pp. 140, with 102 illustrations. J. B. Lippincott Company, 227-231 S. 6th St., Philadelphia 5; Aldine House, 10-13 Bedford St., London, W. C. 2; 2083 Guy St., Montreal, 1952.

This book has the virtues and vices inherent in a brief presentation of any subject. While the important subjects are covered, in many instances they are not covered with sufficient detail for the proper understanding of the problems involved. As would be expected from a book written by a man primarily interested in thoracic surgery, the greatest attention is given to those diseases which are ordinarily treated by the thoracic surgeon. In these areas the book speaks with clarity and authority. The lack of balance is demonstrated by the brevity and lack of detail of such subjects as esophagitis, peptic ulcer, and foreign bodies. The outstanding virtue of the book is the excellent use which is made of the fine illustrations, particularly the drawings. It is because of the drawings that the brief character of the book is made possible. If for nothing else, the excellent choice and quality of the drawings make this book worth while. The book is well bound and printed in double columns of large, readable type. There are 12 chapter headings, covering anatomy, physiology, examination and diagnosis, general surgical considerations, congenital defects, diverticula, achalasia, hiatus hernia, varices, malignant tumors, benign tumors, and miscellaneous lesions.

Quelques notions nouvelles sur le vertige: Méthodes d'exploration de l'appareil vestibulaire. By René Mayoux, Professeur agrégé à la Faculté de Médecine de Lyon. Paper, 865 francs. Masson & Cie, 120 Boulevard Saint-Germain, Paris, 6e, 1953.

This monograph presents a series of new interpretations on the etiology and treatment of vertigo—a vertigo not essentially due to either allergy or frank central lesions. The first section of the book deals with vertigo of either hypertensive or arteriosclerotic origin, with a correlation of the status of the central artery of the retina of these conditions. The second section of the book deals with the therapeutic effects of either hypertonic solution or distilled water given intravenously. The author presents an interesting series of case reports which tend to show the beneficial and curative effects of this form of treatment.

The third portion of the monograph deals essentially with a discussion of the various types of vertigo of extraneous origin, such as (1) cervical adenopathies, particularly about the carotid vessels, (2) infectious lesions of the cerebral trunk, (3) objective vestibular findings in the syndrome of Barré-Lieou, (4) a familial cerebellar vestibular syndrome, (5) the Charrière occipital vertebral syndrome and the Arnold-Chiari syndrome, and (6) results of the section of the vestibular pathways in vertigo of central origin.

This is a rather interesting presentation in that it outlines some newer interpretations of the extremely confusing subject vertigo. It may be worth while to follow some of the suggestions of the author, and perhaps some additional findings will arise which may shed some light on both the etiologic problems and a more constructive therapeutic approach.

Les maladies des fosses nasales. By J. Terracol, Professeur à la Faculté de Médecine de Montpellier. Second edition. Paper, 4,995 francs; cloth, 5,615 francs. Pp. 838, with 333 illustrations. Masson & Cie, 120 boulevard Saint-Germain, Paris, 6e, 1953.

The second edition of this book is a complete revision of the earlier volume published in 1936. Many new additions to the work are included. This is a complete synthesis of the present anatomic, physiologic, and pathologic considerations of the nasal fossae.

The book is divided into two principal sections—general and special pathology. Considerable attention is given to both gross and microscopic anatomy, the neurovascular system, and physiology. The interrelationships of the nasal allergy and nasal hormones are emphasized.

Considerable attention is given to the special pathology of the nasal chambers. The newer nomenclature and the changes in therapeutic procedure with the inclusion of the role of the antibiotics are amply described.

The book is very clearly written, easily understood, and amply illustrated with line drawings, and the few surgical procedures that are involved in this work are meticulously described and illustrated. This work is an excellent reference book for many pathologic conditions of the nose and the nasal fossae and should be of value to every rhinologist.

Thoracic Surgery and Related Pathology. By Gustaf E. Lindskog, B.S., M.A., M.D., F.A.C.S., Professor of Surgery, Yale University School of Medicine, and Averill A. Liebow, B.S., M.D., Professor of Pathology, Yale University School of Medicine; with additional contributors, Ralph D. Alley, Instructor in Surgery, Albany Medical College; William E. Bloomer, Instructor in Surgery, Yale University School of Medicine, and Frederick C. Warring Jr., Assistant Clinical Professor of Medicine, Yale University School of Medicine. Price, $15.00. Pp. 644, with 285 illustrations and 1 color plate. Appleton-Century-Crofts, Inc., 35 W. 32nd St., New York 1, 1953.

This is a timely book dealing with the many problems of thoracic pathology and present-day treatment. Tuberculosis is given a great deal of consideration, with complete chapters on pathology and general treatment from the surgical standpoint. Therapeutic pneumothorax, oleothorax, pneumoperitoneum, phrenic nerve paralysis, pneumonolysis, thoracoplasty and resection are treated in great detail. Many other pulmonary conditions are likewise presented in great detail. The chapters devoted to the lesions of the heart and the mediastinum, esophagus, and diaphragm are comprehensive and present a clear-cut discussion of all the newer therapeutic, both medical and surgical, measures that are in vogue. Each pathologic condition is clearly described and supplemented with gross microscopic and radiologic illustrations. The surgical procedures are clearly and amply described. In addition to an extensive bibliography following each chapter, there is a splendid index. While this book should be of extreme interest to the internist and general practitioner, it also should be of great value to the specialized thoracic surgeon.

Pathologie de l'amygdale: Angines aiguës, banales et spécifiques et leurs complications: Infections chroniques, tumeurs. By R. Maduro, Professeur agrégé à la Faculté de Médecine de Paris, Oto-Rhino-Laryngologiste des Hôpitaux. Paper, 1,920 francs. Pp. 318, with 58 illustrations and 2 color plates. Masson & Cie, 120 Boulevard Saint-Germain, Paris, 6e, 1953.

This is an excellent presentation of the problem of the tonsils. There is a clinical description of each pathologic entity, which includes the pathology, bacteriology, and the pathologic-anatomic relationships, with a detailed discussion of the present theories and suitable therapy in each condition. The relationship of the lesions of the tonsils to the neighboring structures, such as the pillars, palate, pharynx, and buccal mucosa, is thoroughly evaluated. Many intimate pathologic conditions of the tonsils are clearly described. Most of the clinical descriptions are the result of personal experiences of the author, and he reflects the results of 30 years of hospital consultations. Many of the pathologic conditions are clearly described and supplemented with photomicrographs to give a clearer understanding. There is also an extensive bibliography.

This book presents a comprehensive compilation of the present-day knowledge of the diseases of the pharynx and tonsils and is an excellent reference book.

Directory of Otolaryngological Societies *

FOREIGN AND INTERNATIONAL

Canadian Otolaryngological Society

(Société Canadienne d'Otolaryngologie)

President: Dr. D. E. S. Wishart, 170 St. George St., Toronto.
Secretary: Dr. W. Ross Wright, 361 Regent St., Fredericton, N. B.
Place: Minaki Lodge, Minaki, Ont.

Fifth International Congress of Oto-Rhino-Laryngo-Broncho-Esophagology

Place: Amsterdam, Netherlands.
President: Prof. Dr. Eelco Huizinga.
General Secretary: W. H. Struben, Viottastraat 1, Amsterdam-Z.
Scientific Secretaries: Dr. J. Bijtel and Dr. P. G. Gerlings.

International Bronchoesophagological Society

President: Dr. Andre Soulas, Paris, France.
Secretary: Dr. Chevalier L. Jackson, 1901 Walnut St., Philadelphia 3.
Meeting: Third International Congress of Bronchoesophagology.
Place: Lisbon, Portugal. Time: September or October, 1954.

International Congress of Audiology

Place: Leyden, Netherlands.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland.

International Course in Paedo-Audiology

Place: Groningen, Netherlands.
General Secretary: Dr. H. C. Huizing, 182 Oostersingel, Groningen, Holland.

Pan American Association of Oto-Rhino-Laryngology and Broncho-Esophagology

Meeting: Fourth Pan-American Congress of Oto-Rhino-Laryngology and Broncho-Esophagology
Place: México, D. F., Mexico. Time: Feb. 28-March 4, 1954.
President: Dr. Justo Alonso.
Exec. Secretary: Dr. Chevalier Jackson, 1901 Walnut St., Philadelphia 3.
President of Congress: Dr. Ricardo Tapia Acuna.

Third Latin-American Congress of Otorhinolaryngology and Bronchoesophagology

Place: Caracas, Venezuela. Time: Feb. 21-25, 1954.

NATIONAL

American Medical Association, Scientific Assembly, Section on Laryngology, Otology and Rhinology

Chairman: Dr. Dean Lierle, Iowa City.
Secretary: Dr. Sam H. Sanders, 1089 Madison Ave., Memphis 3.
Place: San Francisco.

* Secretaries of societies are requested to furnish the information necessary to keep this list up to date.

AMERICAN ACADEMY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

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Place: Palmer House, Chicago.

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President: Dr. LeRoy A. Schall, 243 Charles St., Boston.
Secretary-Treasurer: Dr. Dean M. Lierle, University Hospitals, Iowa City.
Place: Statler Hotel, Boston. Time: May 10-15, 1954.

AMERICAN BRONCHO-ESOPHAGOLOGICAL ASSOCIATION

President: Dr. Edwin N. Broyles, 1100 N. Charles St., Baltimore 1.
Secretary: Dr. F. Johnson Putney, 255 S. 17th St., Philadelphia 3.
Place: Statler Hotel, Boston. Time: May 25-26, 1954 (afternoons only).

AMERICAN LARYNGOLOGICAL ASSOCIATION

President: Gordon F. Harkness, 215 Main St., Davenport, Iowa.
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Place: Statler Hotel, Boston. Time: May 20-21, 1954.

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Place: Statler Hotel, Boston. Time: May 25-27, 1954.

SECTIONS:

Eastern.—Chairman: Dr. Daniel S. Cunning, 118 E. 53rd. St., N. Y. 22.
Place: Hotel Syracuse, Syracuse, N. Y.
Southern.—Chairman: Dr. William C. Wolfe, 332 W. Broadway, Louisville 2.
Place: Andrew Jackson Hotel, Nashville, Tenn.
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Place: The Elks Club, Los Angeles.

AMERICAN OTOLOGICAL SOCIETY, INC.

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Secretary-Treasurer: Dr. John R. Lindsay, 950 E. 59th St., Chicago.
Place: Statler Hotel, Boston. Time: May 16-17, 1954.

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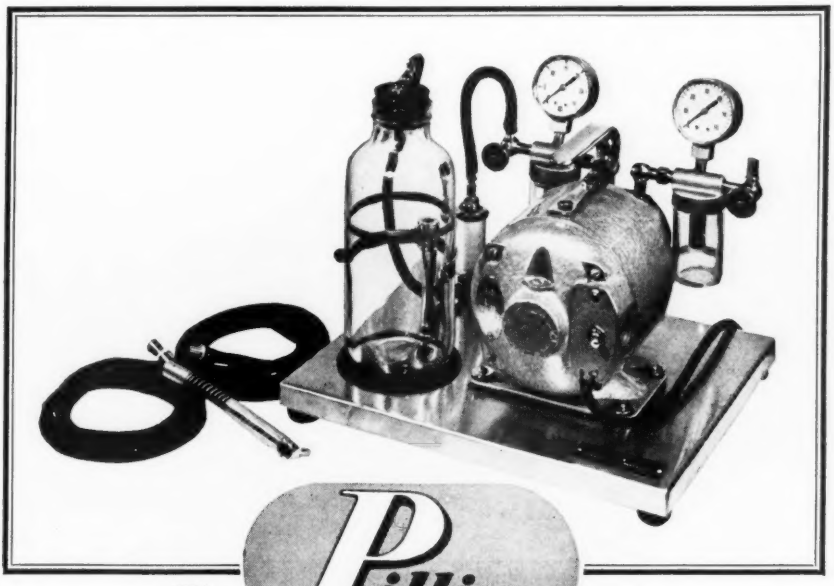
Place: Palmer House, Chicago.



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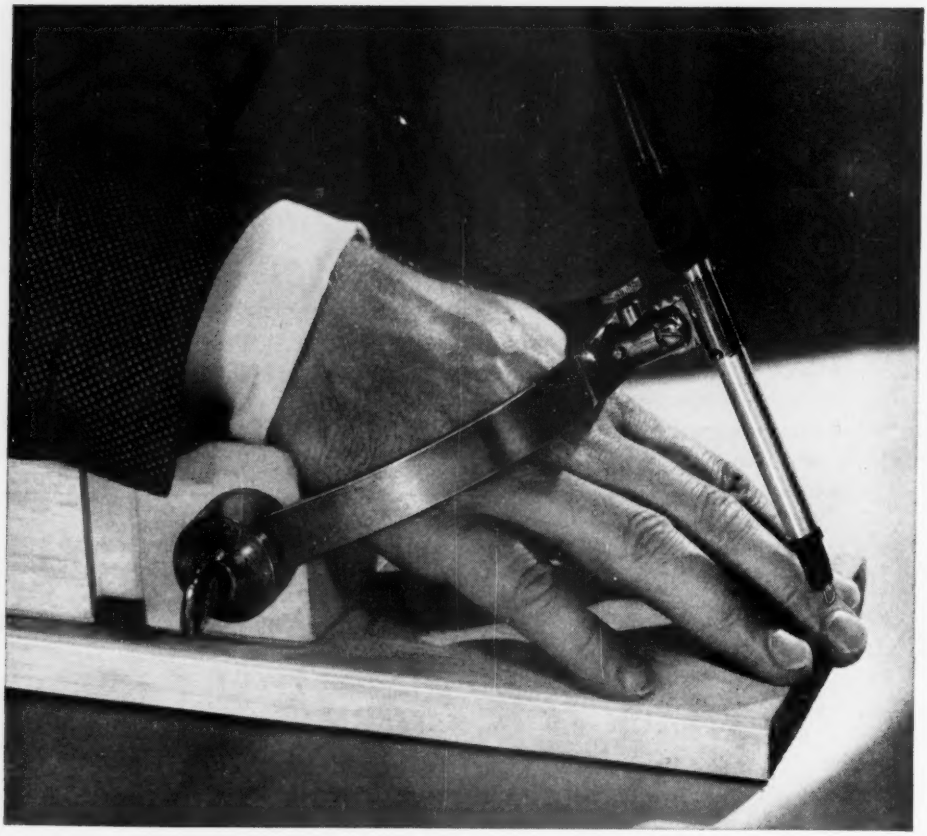

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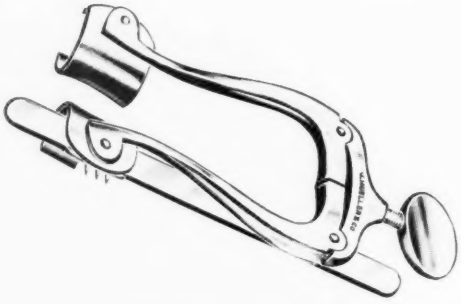

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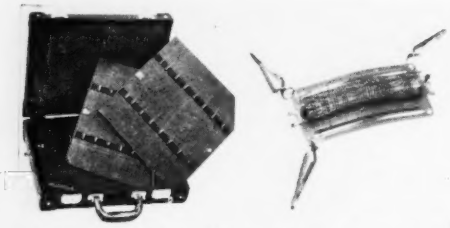

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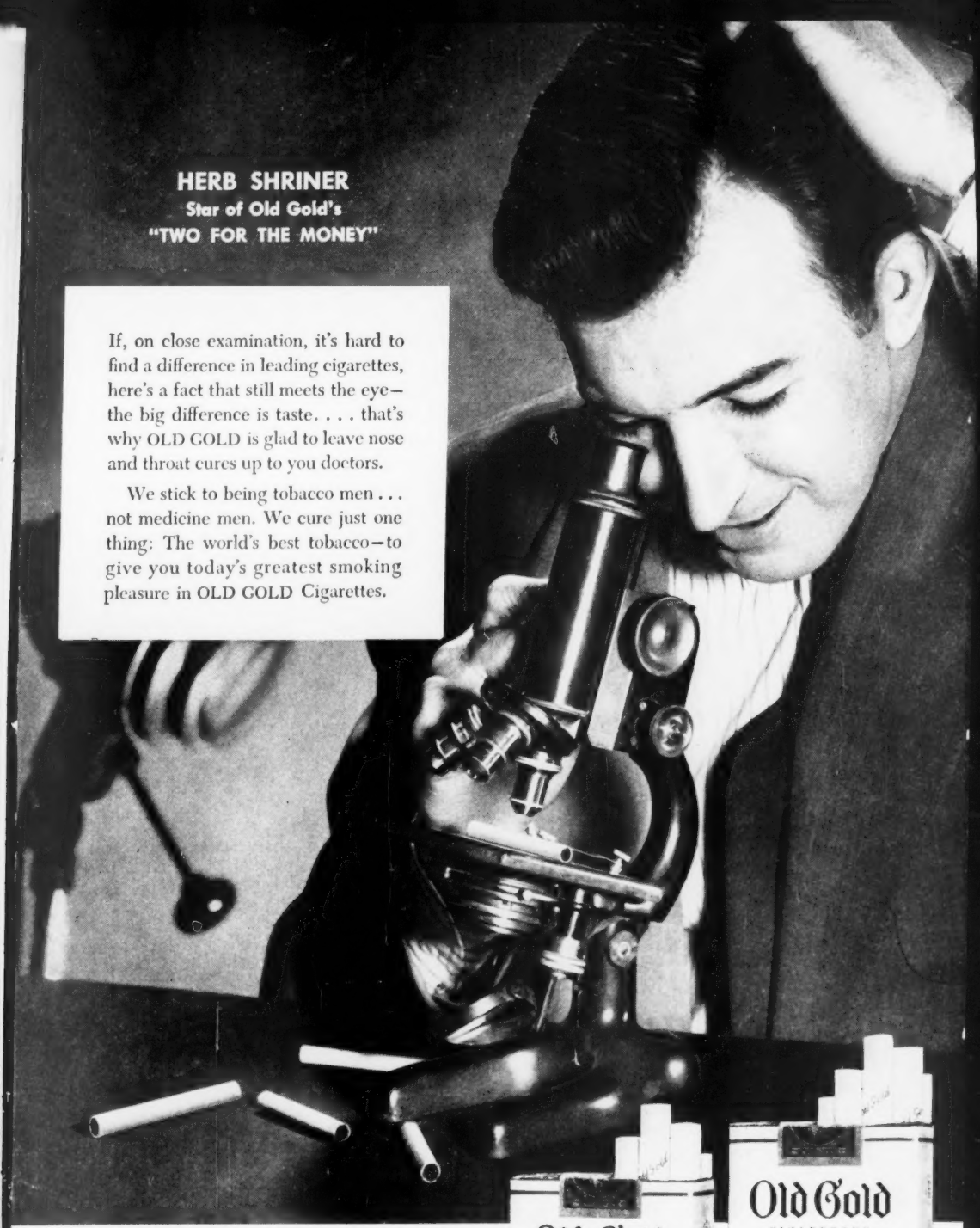

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Star of Old Gold's
"TWO FOR THE MONEY"

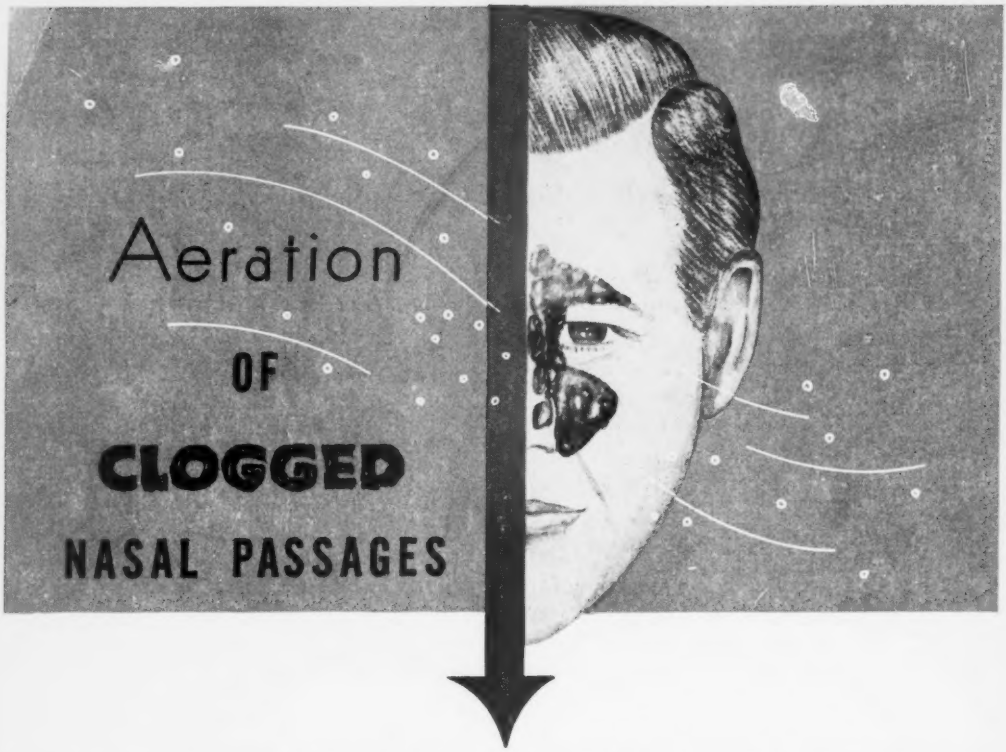
If, on close examination, it's hard to find a difference in leading cigarettes, here's a fact that still meets the eye—the big difference is taste. . . . that's why OLD GOLD is glad to leave nose and throat cures up to you doctors.

We stick to being tobacco men . . . not medicine men. We cure just one thing: The world's best tobacco—to give you today's greatest smoking pleasure in OLD GOLD Cigarettes.

TUNE IN HERB SHRINER in "Two for the Money" on radio and television

For a Treat instead of a Treatment... smoke Old Golds

SAME FAMOUS BLEND IN BOTH REGULAR AND KING SIZE!



Breathing comfort as well as proper drainage and aeration of the sinuses during upper respiratory infections is assured by the swift and prolonged decongestive action of

NEO-SYNEPHRINE®

HYDROCHLORIDE

By shrinking the swollen mucosa, Neo-Synephrine permits drainage of purulent matter, restoring free breathing and relieving the headache caused by clogged passages.

RAPID AND PROLONGED ACTION Clearing of nasal obstruction follows within seconds after application of Neo-Synephrine and is unusually prolonged, so that comparatively few daily applications are necessary throughout the course of a cold.

WELL TOLERATED Neo-Synephrine is notable for its relative freedom from sting, virtual absence of compensatory congestion and also has been found relatively free from systemic side effects such as nervous excitation, cardiac reaction or insomnia even when tested on hypertensive, cardiac and hyperthyroid patients.[1]

NO APPRECIABLE INTERFERENCE WITH CILIARY ACTIVITY Neo-Synephrine not only restores nasal patency, but is compatible with ciliary action.

NO DROWSINESS Neo-Synephrine may be used by the ambulatory patient without danger of producing drowsiness or related sedative action. Applied topically, Neo-Synephrine confines its action to the upper respiratory passages.

SUPPLIED:

0.25% solution (plain), 1 oz., 4 oz. and 16 oz. bottles.

0.25% solution (aromatic), 1 oz. and 16 oz. bottles.

0.5% solution, 1 oz. bottles.

1% solution, 1 oz., 4 oz. and 16 oz. bottles.

0.5% water soluble jelly, ⅝ oz. tubes.

Neo-Synephrine, trademark reg. U.S. & Canada, brand of phenylephrine

1. Van Alyea, O. E., and Donnelly, Allen: *Arch. Otolaryng.*, 49:234, Feb., 1949.

WINTHROP-STEARNS INC. • New York 18, N. Y. • Windsor, Ont.

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